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ABSTRACT

This document describes generic skills profiles relevant to key jobs in information and communications technology (ICT). The profiles cover the main job areas for which the ICT industry is experiencing skills shortages. These types of information are provided for 18 generic job profiles: job description (vision, role, lifestyle); examples of job titles; tasks associated with the job; technology areas associated with the job; type and level of skills; description of career path/future opportunities; the type of person this job would suit; businesses in which jobs of this type are typical; and an interview with an individual employed in this area. The generic job profiles include five in telecommunications (radio frequency engineering, digital design, data communications engineering, digital signal processing applications design, communications network design); five in software and services (software and applications development, software architecture and design, multimedia design, IT business consultancy, technical support); three in products and systems (product design, integration and test/implementation and test engineering, systems

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specialist), and five in cross sector (ICT marketing management, ICT project management, research and technology development, ICT management, ICT sales management). Appendixes include lists of behavioral skills and definitions and of technical skills and definitions. (YLB)

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future skills for tomorrow's world

generic ICT skills profiles

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Erkki Liikanen

European Commissioner
for Enterprise and Information Society

The availability of adequate information and communication technologies (ICT) skills is an important condition for the competitiveness of enterprises in the e-Economy and is becoming increasingly important for the European economy as a whole. The development of e-business applications is increasing the demand for individuals with creativity and higher-level conceptual skills that will enable enterprises to increase productivity and harness ICT to produce greater economic value. Growth, competitiveness and employment are dependent on the successful application of new technologies, while demographic factors, business cycles and rapid technological change increasingly result in quantitative and qualitative imbalances in the supply of skilled labour.

The recent developments in the e-Economy and in the ICT sector prove that it is essential for policy makers to monitor the evolution of the needs of the ICT and user industries closely, and to better identify and forecast their quantitative and qualitative requirements. Improving and increasing the availability of people with ICT and e-business skills involves action both at European Union and national level, in several policy areas: i.e. in education, training, enterprise and labour policies primarily, but it also involves action in other domains such as immigration, outsourcing, taxation and research. In September 2001, the European Commission established an "ICT Skills Monitoring Group" to monitor the demand and the actions aimed at improving the availability of ICT and e-business skills in Europe.

In this context, the European Commission supports the industry-led Career-Space initiative. It is the largest initiative of its kind at European level. Good work and co-operation between Industry, the European Commission services and national governments, has already been achieved. Career Space shows that co-operation between industry and government can work and is indeed very productive, and that public-private partnership is essential to establish consensus and spread information on workable solutions.

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ABOUT CAREER SPACE

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THE GENERIC SKILLS PROFILES

Eighteen generic job profiles have been developed to-date in the following areas:

Telecommunications

Software & Services

Products & Systems

Cross Sector

The profiles provide a comprehensive description of:

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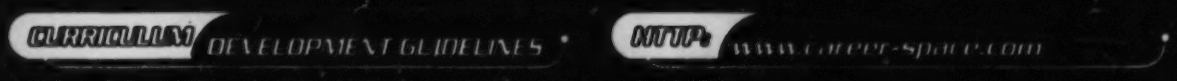

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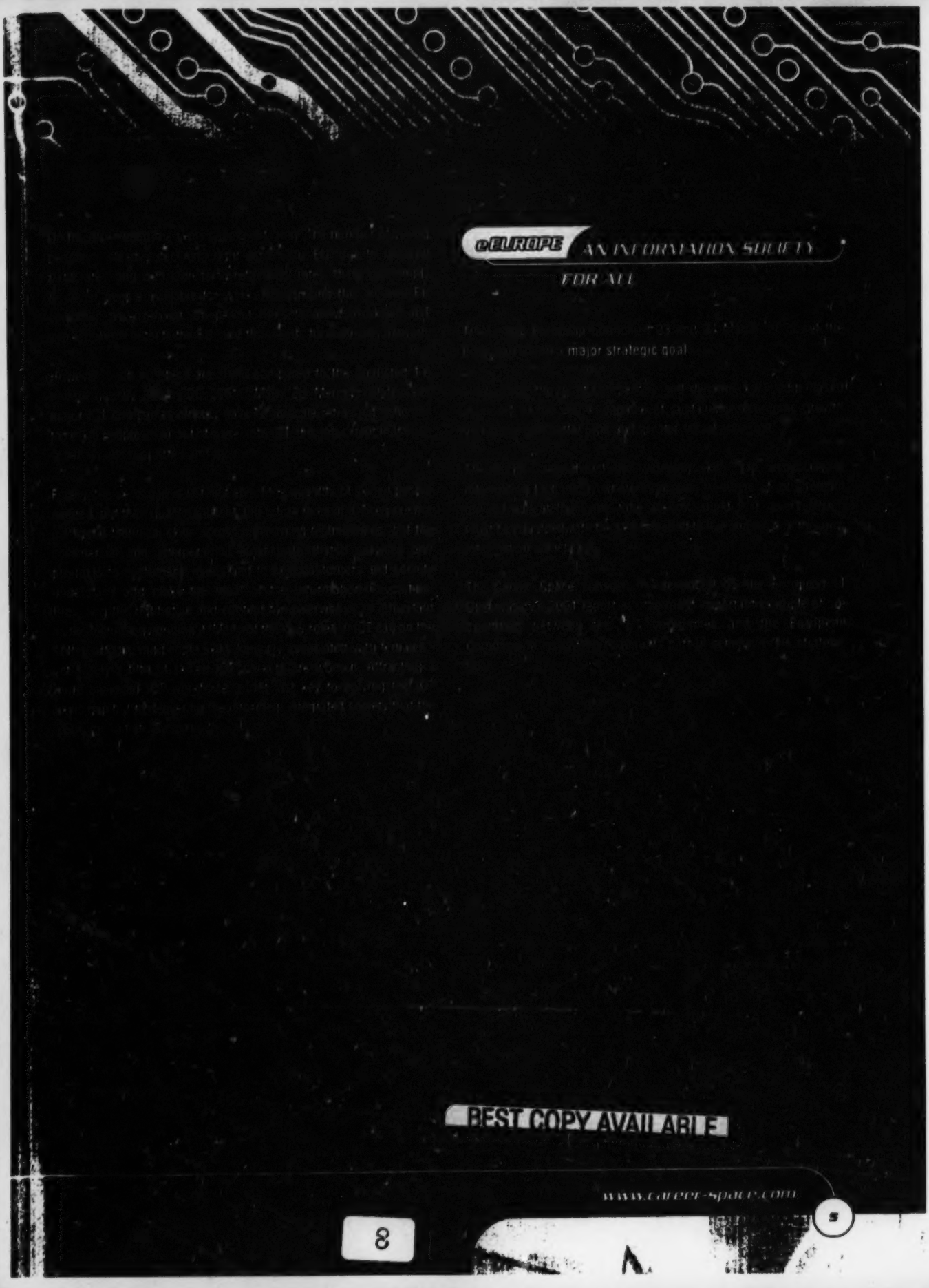
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BROAD JOB AREA

Radio Frequency

JOB DESCRIPTION

The Vision

A feature of the global information revolution is the demand for people to be in instant communication anywhere, anytime, on the move, at fixed points. Radio waves are the medium, which provide instant, flexible mobile communications. The R.F. designer has to keep up with fast developing and emerging technologies in order to deliver reliable services at low cost, as this is a fiercely competitive international area of endeavour. The nineties were the era of personal computing; the next decade will be the era of interpersonal computing. The next generation of personal communications devices will be a much more than up graded mobile phones, they will include a palm top computer, a camera, a note book, the Radio Engineer will be at the forefront of these developments.

The Role

The R.F. Engineer is a master of complicated high-tech. testing instruments and powerful simulation tools. The R.F. Engineer specifies, simulates, designs, implements, tests, integrates and/or maintains R.F. sub-systems used mobile phones, base stations and microwave radios. He/she needs to know the system architecture and specifications as well as available components, semiconductor technologies, master R.F. design methods and simulation tools, layout rules and tools as well as testing techniques and instruments.

EXAMPLES OF JOB TITLES

The Lifestyle

The whole world is moving towards wireless based communications which is unimaginable without RF- Engineering. To be able to keep up with the latest technologies, the R.F. Engineer needs to actively participate in training and other developmental activities. The design of a R.F. sub-system requires both independent and team working. The people the R.F. Engineer most often communicates with are other R.F. Engineers (who are specifying/designing closely related parts of the system), baseband designers (whose design will be interfacing with the R.F. sub-system), project managers and production managers (to ensure manufacturability). Relationships with people ensuring quality are very important for the R.F. Engineer.

(RF) Engineering

TASKS ASSOCIATED WITH THE JOB

- Participation/monitoring in system/architecture specification in order to understand how the system operates and how the R.F.'s own sub-system (signal input/output) relates to the whole system.
- Sub-system specification in order to translate the requirements derived from upper level (system specification) into more detailed technical specifications of how the sub-system should function internally to create the required responses (outputs) to certain input signals.
- Integrating R.F. sub-systems into the complete system.
- Material/component selection to ensure that the most suitable (technologically advanced, reliable, compatible and possibly low cost) components are used. Also manufacturability has to be taken into account.
- Simulation of designs with the help of computer models before building physical prototypes.
- Sub-system circuit design: this is often in parallel with the simulation.
- Ensuring that reliability requirements are met in the design: these include E.M.C (electromagnetic compatibility), safety, manufacturability and thermal design aspects.
- Layout design: designing the physical layout of the circuit and components on the printed circuit board or other component base.
- Test specification to define the required test methods, cases and results. This is done by reflecting the original specifications.
- Unit testing: testing the unit according to the test specifications, finding causes for possible failures and solving the problems.
- Participation in design reviews to ensure the design work is proceeding according to agreed processes and quality requirements.
- Participation in the specification and support of engineering processes and tools.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Receivers
- Transmitters
- Transceivers
- Power Supply
- Synthesizers
- Oscillators
- Analogue Digital (A/D) Converters
- Digital Circuit Design
- A.S.I.C. (Application Specific Integrated Circuit) Technology
- Digital Signal Processors
- Antennas, Digital and Analogue Filtres, Amplifiers, Power Amplifiers, Mixers

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Analytical
- Creative
- Teamwork
- Communication
- Problem Solving
- Flexibility and Self Learning
- Efficiency & Quality
- Business Acumen – Business Awareness

Technical Skills

- Technology, Component, Material Knowledge and Thermal Design
- Testing and Reliability Engineering
- R.F.I.C. Design Tools
- Radio Frequency Theory Circuit Design and Methods
- Electronics Theory and Know-How (analogue/digital)
- RFIC, ASIC Design, SoC, Antenna Design
- D.S.P. (Digital Signal Processing)

Astrid S

Dipl. Ing. electrical engineering
Ruhr University Bochum
Philips Semiconductors

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

The career of a R.F. Engineer would normally start as a designer for small sub-systems. The next step could include tasks in both the specification and design of sub-systems. If choosing the technical expert career path, it could lead to the position of a specialist in a particular domain, which requires building up an extensive knowledge as well as problem solving skills in a certain area. Another possibility would be Radio System Specialist, which in turn requires a wide technological base and holistic view of radio systems. Somewhat less technology development -oriented career moves could be the ones of Project/Team Leader or Technical Account Manager, who are responsible for customer interface.

THE TYPE OF PERSON THIS JOB WOULD SUIT

A creative person with the desire to use leading edge ideas and technology to solve complex problems would like this job. Entry to jobs within this profile requires a Bachelors degree (first cycle degree) in engineering or related technology subjects.

JOBS OF THIS TYPE ARE TYPICAL IN

Nokia, Philips Semiconductors, Siemens AG, Telefónica S.A., Thales.

When I left university in 1995 I joined the Technology Centre for Mobile Communication of Philips Semiconductors in Nuremberg taking the position of a development engineer in transceiver technologies. It was my first choice for two simple reasons: All the potential colleagues were quite nice and friendly, and the laboratory appeared to me like paradise.

In 2000 I relocated to our systems laboratory in Hamburg where I meet new challenges in the digital field in charge of a systems engineer. Since I'm connected to Philips I deal with GSM systems for mobile phones and I really enjoy my work, it is quite manifold with a bandwith from research to production.

My job in Nuremberg was focused on analogue RF transceivers. This first of all implies to define new architectures embedded in a full system which are improved with regard to costs, size and current consumption or even functionality, features and handling capability - all having regard to the requirements on the overall system.
Therefore we consequently monitor our research and advanced development activities within Philips, verify those and propose new architectures by means of estimations, calculations and initial simulations on behavioural level based on our state-of-the-art expert knowledge and on consideration of customer requirements and potential risks. During this work the IC design centres are extremely involved.

Our RF IC design team investigates design feasibilities with respect to process technology, silicon area and current consumption. Therefore one of the major tasks is to translate system requirements to RF IC specifications and vice versa. In contrast to the way of working in the digital field we here need to interchange IC design feasibility and system performance continuously in order to approximate the favour solution.

Another task is the partitioning of several architecture blocks to the IC's of the system. This means to map the system to IC interfaces and to decide on hardware versus software realisations as well as integration versus application of components. We also have to verify the implementation of new RF IC blocks according to their influence on other hardware components, firmware and software. After a hard way to reach agreement of all parties involved we have to take special care of the interfaces.

During IC design phase we support the designers by specification details and level planning which improves understanding on both sides and enables more detailed simulations of the system by alignments of the behavioural models.

The customer is involved in all steps of our work. (These are not that kind of customers you have to visit armed with a necktie and suit...) The customer performs cross-checks and gives inputs concerning the experiences on production line and products.

Above all I enjoyed the challenge to find better system solutions by optimisation opportunities beyond IC interfaces which involves team-work of different nationalities at several locations within Philips. This offered a big scope of knowledge to me which pushes consistent improvement.

Specification and design are followed by a validation phase which was part of my work as well. For this purpose we define an evaluation environment and create a PCB. Testing options and external components are selected and special care is taken of the PCB layout. Further on we think about our evaluation strategy.

As soon as first engineering samples are available IC evaluation together with the designers and the customer commences. One major task is to perform analogue measurements at several outputs within the chains in order to return information about the behaviour of integrated blocks for to validate the IC and to solve potential problems.
At the same time we start system integration within a sub-system containing all digital parts of interest to validate the new architecture according to the system requirements. Now we have to work close together beyond our internal interfaces, and spend a lot of effort on the testbenchs setups which include digital hardware and firmware. All sites are interested in the results. The measurements are of importance as well to validate our assumptions during specification. In this phase we also get closer in contact to our customer evaluating together on system level. By this we are able to train him on the architecture and again gather from our customers view. The last step is the design-in support which will result in a product on the market. That's great!

My first perception when starting work in Nuremberg was: I never expected so much technology, variety and know-how in a simple mobile phone. Today's complexity of our buisness products and customer requirements do not allow us to focus on single components, but demands for to look at their use as a part in a full system. Therefore we are looking for engineers who aren't afraid of entering technical areas which do not match to their current skills.
According to this I think it's more useful to know how to acquire knowledge rather than how to keep everything in mind without knowledge about how to make use of it. Interest in both theory and practice is helpful as well.

During the years of study at university research work quickened more and more of my interests. I was quite fascinated by theoretical explanations of reality and engaged in finding new mathematical concepts. For sure I still can picture to become somebody omniscient in a quite special and complicated detail of my profession where no one else is interested in. Nevertheless I decided to leave this ivory tower recognising that time-to-market pressure opens doors and makes things happen. An experience I'll never regret.

Although my basic choice was being an engineer I never got rid of all these psychological aspects present everywhere in my daily business and hidden in tasks like synchronising to other people ways of understanding, keeping leading ideas during discussions, fighting for progress and goals, coaching new colleagues, motivating team members, solving conflicts, and so on. All these non-technical skills are quite important as well.

BROAD JOB AREA

Digital Design

JOB DESCRIPTION

The Vision

In the next few years the sum of total human knowledge will be digitalized and made accessible via the internet. Together with the convergence of communications and computing onto common digital components, these will spur the contemporary desire to communicate information anywhere, anytime, faster, cheaper and more reliably. These trends push the frontiers of digital design forward remorselessly. Digital designers conceive information processing architectures, then translate them into circuits and components, which integrate, to deliver the overall aims from processor chips to satellite communications. This is a deep technological role for those who wish to develop careers in one of the key technologies which enables the information age.

The Role

The Digital Designer specifies, designs, implements and verifies/tests digital circuits used in telecom products, pc's, audio, video, terminals, network elements and internet related products. She/he simulates integrated circuits and evaluates engineering samples. The major future challenges in digital design are the increasing complexity, the packaging density as well as high speed, low cost and reliability requirements.

The Lifestyle

Due to the technical complexity, working in teams is essential, usually on an international and multi-site level. This means the Digital Designer needs to play an active role in preparing and mutually exchanging information via up-to-date communication tools like e-mail, telephone and video conferencing. Joint team meetings are held on a regular basis, which involve national and international travel. The Digital Designer has direct contacts with suppliers and customers for training, introduction of technical products and solutions, problem solving and support purposes.

EXAMPLES OF JOB TITLES

TASKS ASSOCIATED WITH THE JOB

- Participation in the definition of architectures, translating the digital parts into circuit diagrams as inputs for the design and development of printed circuit boards and integrated circuits. Putting the initial boards into operation and testing them.
- Using these boards for verification and system integration and lower layer test S.W and drivers for S.W. as H.W. platforms.
- Keeping in close contact with designers involved with development of circuits having interfaces with his/her solution.
- Documenting the results of his/her work and creating user documentation.
- Supporting users in the design-in phase starting with training, answering questions and giving technical support.
- Using state of the art measuring and test equipment and support tools.
- Design of signal processing algorithms for implementation in hardware.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Board design, system emulators
- CMOS circuits, mixed signal circuits
- Microprocessors
- D.S.Ps (Digital Signal Processors)
- F.P.G.A.s (Field Programmable Gate Array's)
- P.C.B.s (Printed Circuit Boards)
- Standard integrated circuits, baseband system simulation

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Problem Solving
- Analytical
- Creative
- Attention to Detail
- Teamwork
- Communication
- Technical Orientation and Interest
- Professional Attitude

Technical Skills

- Digital Design Skills
- Systems Development Tools
- Technology, Component and Material Knowledge
- System Design
- Reliability Engineering
- Testing
- Hardware Knowledge
- Application Design Concepts
- Documentation

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

The career path would normally start with the position of Digital Designer, developing to a Digital Design Specialist. Enlarging the technical scope towards neighbouring fields, it can progress to System Architect or with a higher content of organisational and administrative work to Project/Team Leader.
With a stronger focus towards customers and sales, progressing towards Technical Account Manager would be a possible career development.

THE TYPE OF PERSON THIS JOB WOULD SUIT

If you are the kind of person who likes working with the technical equipment in fields of PC, Audio, Video and both writing-up and discussing your results with other team members then you will enjoy this job.
Entry to this job requires a Bachelors (or first cycle degree) degree.

JOBS OF THIS TYPE ARE TYPICAL IN

IBM, Intel, Nokia, Philips Semiconductors, Siemens A.G., Thales.

Tomi O
B.Sc. Telecommunications Engineering
Helsinki Institute of Technology, 1998
Nokia

After the sixth form college I was working for a while in the electronics industry. I felt it was necessary to study some electronics and I first started studying to become an IT mechanic. In the following year, however, I transferred to an IT technician program. After I graduated as a technician in Spring 1993 I started at Nokia as a test technician. I was performing release testing of Nokia fixed switches, both in the software and hardware side. In this work, my interest in telecommunications and electronics grew even more, and after one year I began studying at night school, after work to become an engineer (B.Sc.) in telecommunications. At a later stage of my studies I moved at work from testing to electronics product development, where I also did my thesis. Considering my current work, I feel the most important courses I had at school were in digital transmission, electromagnetic wave- and field theory and ASIC-VHDL. Also data transmission and IP technology courses seem to have growing importance.

In this work, it is possible to develop one's competence by attending different courses and it is a person's own responsibility to gain the knowledge needed in work by selecting the right courses. Not all courses in the selection are technical. I study English among other things. At night school, the most important support from Nokia's side was to allow four hours of working time, weekly, for studies. At work it is great to be surrounded by a group of experts whose technical advice you can always seek when needed.

At the moment I am working in an electronics department's computer interfaces section as a HW Engineer. My work includes a lot of different tasks, the main one of which is the maintenance of certain plug-in units used in switches. This means acting as an expert to different product lines and customer service, solving problems and the design and verification of technical improvements. In addition to that, I participate in the verification of future designs of some new plug-in units. My working experience in testing helps in understanding the structure and functioning of a switch. That in turn helps in perceiving the operation of the plug-in units and how they link to the whole system.

The most interesting parts of my job are to do with the analogue- electronics characteristics related to high speed digital electronics, e.g. the behaviour of signals on transmission lines. Challenging aspects are quality issues that relate to the functional reliability and fault tolerance of electronics. My motivation is to develop my competence to try to help to create a better environment by selecting energy saving, less stressing EMC solutions. I prefer a working environment with adequate working space, equipment and an inspiring atmosphere.

My best work qualities are being analytical, creative and careful. Being analytical helps when solving problems but also when designing new features. Often the creativity assists in finding a new perspective to solve a problem. Quality work is achieved by doing things carefully, right the first time, not by correcting mistakes.

To students of this field I would say that as long as you can handle mathematics, physics and theoretical electricity, you will succeed in your studies and manage the work.

My hobbies include jogging, cycling and reading technical books and journals.

BROAD JOB AREA

Data Communica

JOB DESCRIPTION

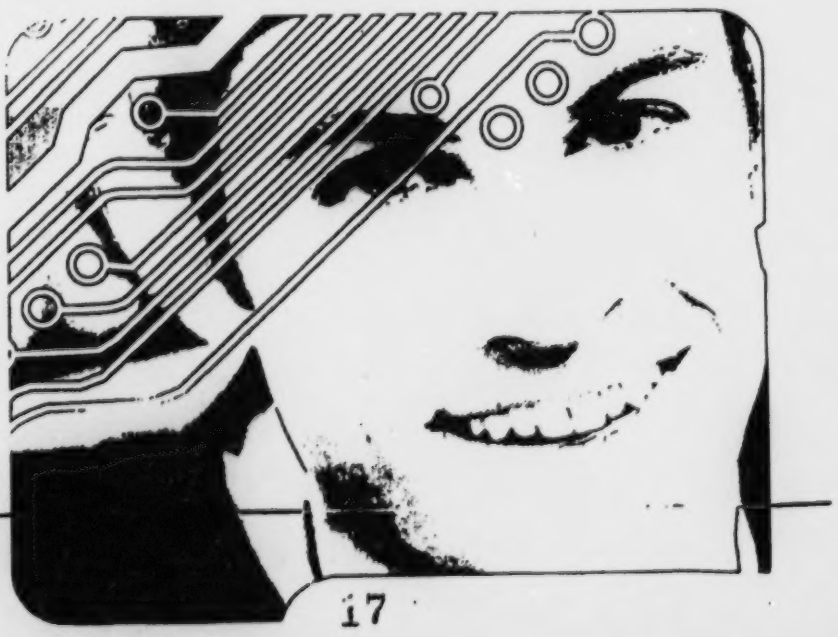
The Vision

Access to the Information Age depends on data communications working across all frontiers, technologies and applications. Voracious user demand calls for faster transmission at greater bandwidth with enhanced security, and as this is a competitive market, at lower cost. Voice, moving image and text have all to be handled seamlessly. The Data Communications Engineer has to understand current protocols, network devices and components, software engineering, emerging theory and practice, to work with colleagues to design cost effective technical solutions to exponentially growing traffic requirements. This is a technical career for people who wish to exploit technology to create innovative architectures to support information transmission and management systems. A desire for lifetime learning and technical challenge, and to apply knowledge to create practical solutions, is a prerequisite for people who wish to enter Data Communications as a career.

The Role

The Data Communications Engineer specifies, designs, implements, tests, integrates, supports, and maintains switches and network management systems used to implement data communications networks. He/she designs complete networking systems for connecting end terminal equipment such as PCs to Local and Wide Area Networks. The Data Communications Engineer works with customers to determine requirements for equipment and services (such as Mobility, IP Telephony, Video Conferencing, IP Fax, and Security); develops network architectures to satisfy the requirements; simulates and analyses architectural solutions; makes decisions to build or buy the necessary equipment; and designs, develops, tests, and integrates new products to fill gaps in existing product lines. They can be involved in circuit development and debugging, FPGA design and CAD using a range of software tools.

EXAMPLES OF JOB TITLES



tions Engineering

The Lifestyle

The development of a data communications system or product requires very close collaboration with colleagues, but it also requires reliable and timely fulfilment of individual responsibilities. Engineering teams must communicate effectively to develop a common understanding of the product they are implementing and co-ordinate the many individual activities it will take to complete the effort successfully. Individuals must follow through by producing architectures, designs and software that meets requirements on schedule so that the overall effort stays on track. The final stages of a product development effort can be very exciting as many engineers come together to integrate their software and work out the final problems in time for promised deliveries to customers.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Embedded processors, hardware architectures,
- transmission media (wired and wireless) and hardware interfaces,
- real-time operating systems,
- I.P.,
- distributed algorithms,
- parallel computing,
- WWW (e.g., http, cgi, browsers, servers),
- UNIX, and network simulation and analysis,
- R.F. backbone architecture.

TASKS ASSOCIATED WITH THE JOB

- Working with customers to determine requirements for equipment and services (such as Mobility, I.P. (internet protocol) Telephony, Video Conferencing, I.P. Fax, and Security).
- Developing network architectures to satisfy the customer's requirements.
- Simulating and analysing architectural solutions.
- Identifying opportunities for development of new internet products.
- Assisting in the specification of suitable hardware architectures as the basis of new products.
- Developing software architectures that are tailored to the proposed hardware platform and which meet customer requirements.
- Deciding whether to build or buy decisions for the necessary software components.
- Designing, developing, testing, and integrating software for the new product.
- Engineering and trouble shooting.

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Analytical
- Creative
- Teamwork
- Communication
- Professional Attitude
- Problem Solving
- Initiative
- Managing Risks
- Flexibility and Self Learning
- Efficiency & Quality
- Commitment to Excellence
- Customer Orientation

Technical Skills

- Knowledge of Protocols
- Requirements Analysis
- System Architecture
- Software Architecture
- Computer Programming
- Troubleshoot Technical Problems
- Object Oriented Analysis and Design
- System Integration
- Work Estimation and Scheduling
- Ability to understand and evaluate internal/external specifications
- Electronics Theory and Know-how (analogue/digital)

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

The Career path usually involves working with designers of the various components or subsystems at a data communications network. Then designing components and in time designing complete networks.

Some people will choose to concentrate on software leading to software design and software architect. Others will develop organisational and management skills leading to Project and Programme management.

THE TYPE OF PERSON THIS JOB WOULD SUIT

This job requires a creative problem solver capable of working on their own or as part of a team. Opportunities will arise for the kind of person who would like to develop into a project or organisational manager.

A Bachelors degree (first cycle degree) is necessary for this job. Experience in the industry and with ICT customers would also be useful.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Intel, Nokia, Nortel Networks, Philips Semiconductors, Siemens A.G., Telefónica S.A., Thales.

Miguel Á
Telecommunication Engineering in Barcelona
Telefónica S.A.

studied Telecommunication Engineering in Barcelona. At the beginning, I had not a clear vocation. I principally chose it because there was a lot of job's opportunities in ICT Industry. But, as I was learning more and more things and my knowledge was increasing, I realised that I really liked it. The six years of degree were hard but I enjoyed learning new things.

I would like to advise students that they try to join work world as soon as possible. It is important to see what is happening in the enterprises at the same time that you are learning things in University.

When I found my first job, I wanted to do everything. I liked all, every part of the area. It was all so exciting and interesting!. So, I had different jobs: Programming, Network Management, Satellites.

When I was at Satellites Department, we made satellite mobile units. It was a very difficult and accurate labour. We worked under a great pressure. I did several tasks: to define technical specifications, to evaluate technical offers. And also I had to develop my communication skills.

Now I am working for Telefónica Data España as Data Communications Engineer (Frame Relay, ATM, MS...) My principal tasks are to give support to Customer's Engineering and to Operations and to collaborate with Marketing to design new services.

My job is so interesting! I really enjoy everyday. I like to solve problems. And this environment is changing so fast. There is a new thing every new day. That is why I found the ICT sector so exciting. If you do not learn as the same rhythm as this environment is changing, you are getting off.

I think that the most important skills are: curiosity (to have the necessity of learning), open-minded to continuous change, "feel attraction" to technician area.

If you are a curious person and you enjoy in a changing environment, this is your place. A great part of my work is to be keep up to date. I am continuously learning. I do a great effort for it: reading magazines and lots of documents.

I also think that ICT Industry (specially Telefónica Data España) contributes to create a better society. For example, one of my last projects was to create a satellite link to Kosovo to reduce the cost of telephone calls. Soldiers could phone theirs homes cheaper. I did a small part of it but it was rewarding.

BROAD JOB AREA

DSP (Digital Signal Proces

JOB DESCRIPTION

The Vision

Although the world is becoming wired up, it involves many different national, international, regulatory and service provider bodies. Digital Signal Processing Designers have to combine deep technological knowledge - modulation, coding, algorithms with the statutory environment in which they have to operate. This is a deep challenging engineering career for those who wish to specialise in one of the fast moving technologies which underpin worldwide communications. Entry is usually through one of the supporting domains, e.g. algorithm design then progressing to increasing technical complexity and scope across the supporting techniques.

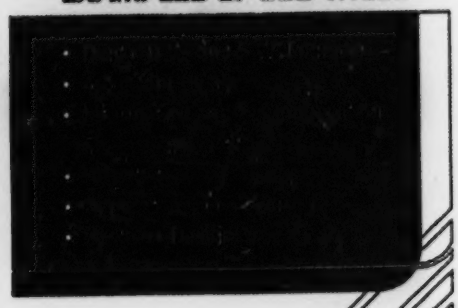
The Role

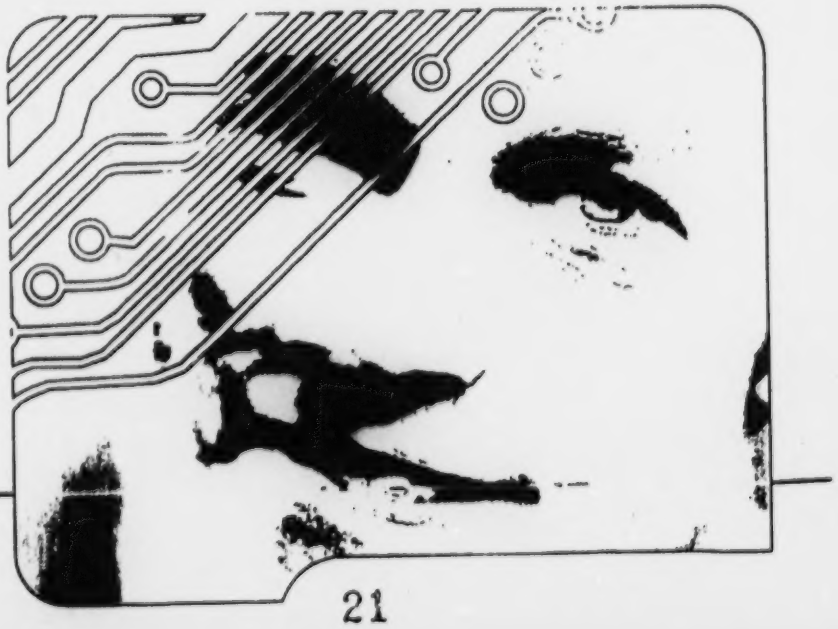
The DSP Applications Designer needs to follow the developments in Standardisation bodies with respect to signal processing. He is involved in requirement studies, simulations and performance analysis and participates in the design and optimisation of algorithms for signal modulation, detection and channel coding/decoding and implementation with signal processors and testing, SW integration and maintenance.

The Lifestyle

The technical complexity of the work means a great deal of team work is needed usually on an international and multi-site level within the company and together with customers or competitors. It also involves participating in international committees. This means the DSP Applications Designer is involved in an active exchange of well-prepared information via modern communication tools like e-mail, telephone and video conferencing. Team meetings are held regularly which involve national and international travel. Due to the importance of algorithms and their strong contribution to the overall system performance, highly innovative work is done constantly.

EXAMPLES OF JOB TITLES





TASKS ASSOCIATED WITH THE JOB

- Being up-to-date with the technical development in this field, monitoring the standardisation work with respect to algorithms and keeping close contact with research in universities.
- Using simulation tools efficiently to check performance and the behaviour of the signals.
- Generating requirements and specifications.
- Designing SW for signal processors and digital filters depending on the application in Assembler or C.
- Coding the SW and implementing it.
- Preparing the system integration and making the testing.
- Delivering new inputs for the specification of new DSP cores.
- Using standard computing HW and SW development tools like configuration management etc.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Digital Signal Processing (DSP)
- Embedded systems
- Real-time applications
- Wireless communication technology
- System simulation technology

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Analytical and Creative
- Attention to Detail
- Teamwork
- Communication
- Problem Solving
- Flexibility and Self Learning
- Commitment to Excellence
- Professional Attitude
- Planning and Organisation

Technical Skills

Comprehensive understanding of the physical layer and specifications of communication systems. Understanding the nature of speech and audio signals and respective codes, systems and standards.

- Digital Design Skills
- System Design
- Hardware Knowledge
- Testing
- System Development Tools
- Applications Design Concepts
- Documentation

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

The career path of the D.S.P. Applications Designer normally starts with the position of a Specialist in a special domain, progressing through positions of increasing technical responsibility such as Algorithm Designer, Signal Path Expert, Core Architect and then Specialist on DSP System Level. With an increasing part of organisational and administrative content it may develop towards Project/Team Leader or Platform Manager. With a stronger focus towards customers a position of Technical Support Manager is possible.

THE TYPE OF PERSON THIS JOB WOULD SUIT

This job role will suit an individual with a technical and scientific orientation. An ability to relate to customer requirements in the solution of complex problems is also needed. A Bachelors degree (first cycle degree) is needed to start this job.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, IBM, Microsoft, Nokia, Philips Semiconductors, Siemens A.G., Thales.

Lene B
M.Sc. Electrical Engineering
Technical University of Denmark, 1994
Nokia

In the later years at the university, I had several courses in digital signal processing, telecommunications and related areas. These subjects are still the basis for my work today, further improved by a number of courses of relevance to my work. Most of my time with Nokia, I have worked as a design engineer within system design and DSP. I have worked on many interesting but also very different projects together with designers from such different areas as DSP, ASIC, RF and SW.

The main part of my work is algorithm development, i.e. designing algorithms for mobile phones, either to add new features or to improve existing functionality. In digital communication systems like GSM this obviously requires skills within digital signal processing, but also understanding the entire system and the principles of radio communication in order to anticipate the effects of increasing functionality of the algorithms. A strong motivation at work is the satisfaction of solving technical problems, the challenge to analyse and understand the full system in order to design the individual parts within it.

The most interesting and challenging aspect of my job is designing complex systems, which requires close co-operation of designers with different areas of expertise, and to be able to communicate across these different areas so that the outcome of the work is an optimised system. This demands understanding of the problems and challenges that your colleagues are dealing with, to be able to comprehend the effects they may have on your own work, and vice versa. I like a positive and constructive working environment, where you can improve continuously and strive to do the best with good support from your colleagues.

As my interest is in technical work, my intentions for the future are to further develop these skills and specialise in this area. During my working life, I have taken mainly technical courses (both internal and external), in order to improve my expertise.

In my spare time I do a lot of sports, right now mainly badminton and skiing, earlier very different sports such as flying sailplanes, and athletics (running hurdles). My hobbies have changed a lot over the years, I like to challenge myself to try new things, not one day wake up and regret all the things I didn't do or try. My family and friends are also very important to me.

BROAD JOB AREA

Communications

JOB DESCRIPTION

The Vision

This area is for those who wish to work with clients to help them formulate, then specify and design their communications needs into viable networks. Communications Network Designers need to understand current and emerging technologies and how they can be exploited to satisfy client needs, from wiring up a single site, to a world-wide network supported by different technologies. The role demands that designers know enough about business needs to be able to assist clients to create their communications requirements, then derive technical solutions. Network design is fiercely competitive and fast developing, with client expectations rising all the time; this is a career for those who relish working with clients to develop technological solutions in a challenging commercial environment. Entry usually requires some technical communications experience or a relevant degree.

EXAMPLES OF JOB TITLES

The Role

A Communications Network Designer designs the network using various suppliers' products. The Communications Network Designer will need to analyse and interpret customer needs and then deliver detailed solutions. The needs are usually complex, and teamworking is essential for meeting them. In many cases, this can be with international partners, who may include other telecom companies and suppliers of both equipment and solutions. Competitor threats demand that the solutions delivered are low cost and high quality. It is important that the designer keeps abreast of the latest technologies and understands the commercial drivers for their work.

Network Design

Some of the solutions that a designer produces are:

- An internet network.
- A mobile network that can offer voice, fax and data services.
- Enhancements to existing networks to take advantage of new technologies, new functionality or capacity extension.
- Networks that enable value-added services, such as multi-media or charge-card services.
- A network that will allow different networks to link (interconnect) and operate together. This could include networks in different countries.

The Lifestyle

Working with a range of suppliers and customers means working closely with others, for example attending meetings to discuss and resolve issues. These meetings will often require the designer to give presentations of proposed designs. The work involves national and international travel, although meetings frequently take place by telephone or videoconference to minimise the cost and time of travel. The designer needs to assimilate and analyse information coming from a variety of sources, including meetings, technical specifications, e-mail and telephone. The designer will be office based working with colleagues, who may be geographically remote, producing the design solutions and using computer programmes to assist in design and modelling.

TASKS ASSOCIATED WITH THE JOB

- Working with the customer to analyse their communication requirements and to determine the most cost-effective solution.
- Working closely with suppliers to build an awareness of their products and to give them an awareness of the future products that the designer will need.
- Working with colleagues from sales and marketing to develop the customer relationship and meet the company's business objectives.
- Responding to customer requirements by giving presentations and preparing formal proposals.
- Providing advice and guidance on the use, operation and design of systems or solutions using specific products.
- Designing, building and running prototypes to test and demonstrate functionality.
- Using computer aided design tools to optimise design efficiency.
- Dimensioning the size of networks to meet the volume/capacity demands of customers.
- Designing, organising and delivering product awareness, skills transfer and product education sessions to other technical specialists in your company and your business partners e.g. suppliers.
- Supporting and working with integration and test engineers so that they understand the design.
- Trouble shooting.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

The Communication Network Designer will perform planning work for the following technologies:

- Mobile networks
- Wireless data networks
- IP (internet protocol) technologies
- S.D.H (Synchronous Digital Hierarchy) & P.D.H.(Plesiochronous Digital Hierarchy) (transmission) technologies
- Microwave radio links
- Switching and intelligent networks
- Backbone architecture
- High bit rate optical transmission systems
- Encryption
- Firewalls

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Business Awareness
- Mentoring
- Communication
- Analytical
- Planning and organisation
- Attention to Detail
- Relationships
- Creative
- Teamwork
- Problem Solving
- Information Handling

Technical Skills

Many of the technical skills required are developed and enhanced while performing the role. When embarking on this career, companies will be looking for a demonstrable enthusiasm and a fundamental aptitude for engineering in the individual applying for the job i.e. an ability to invent, solve technical problems, logical thought and reasoning, attention to detail.

A foundation and awareness of electronic engineering and/or of software/computing are important. Skills that will be developed and enhanced include:

- Information Flow Analysis
- Network Systems
- Network Modelling
- Network Protocols
- Telecom Technology at Network Element Level
- Cost Modelling
- Statistics
- Design Methods
- Security

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

There is no pre-defined career path but roles and opportunities include Design Specialist, System Specialist, Project/Programme Manager, and Platform Manager. Sales and marketing, technical consultancy, business strategy - assessing technical capabilities of other companies for potential mergers / acquisitions and to manage the design project and lead the people in the project team.

THE TYPE OF PERSON THIS JOB WOULD SUIT

This job requires a creative problem solver capable of working on their own or as part of a team. Opportunity will exist for the kind of person who may see themselves developing into a project or organisational manager. A Bachelors degree (first cycle degree) is necessary to enter this job.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Nokia, Philips Semiconductors, Siemens A.G., Thales.

Sally P
First Class Honours,
BA in Computer Science
and Classical Civilisation.
University of Kent at Canterbury (1997-2000)
Cisco Systems.

was initially introduced to the world of the Internet through my studies at University and found it very exciting and interesting. I decided that I wanted to work in the Internetworking and telecommunications world as I could see the way these technologies were changing the way we communicate. I wanted to become involved in an environment that was cutting edge and really making an impact on the way we 'Live, work, play and learn' (John Chambers Cisco CEO).

I chose Cisco because of the way they positioned themselves in enabling this impact – this enables me to get involved with many diverse and interesting projects. Cisco is one of the fastest growing technology companies in the industry = success. Cisco is the worldwide leader in networking for the Internet, the largest supplier of the hardware, software and services used to build unified information infrastructures and the operator of the world's most prolific Internet commerce site. I wanted to work with the best people, the best products and the best ideas without the bureaucracy. I also chose Cisco because of their attitude towards employee empowerment. You get the chance to drive your own career. Cisco recognises initiative and rewards teamwork, allowing decision making to occur right the way down the organisation, empowering everyone to do their job to the best of their ability, as soon as possible. Providing you demonstrate the right skills you get a significant degree of responsibility quickly. The freedom and trust to drive your own career is very valued. There is a mentoring program, whereby each graduate is assigned a mentor who will help you in your career choices and will be a point of contact to aid you in your projects should you need it. Trust extends to giving employees the choice of coming into the office or teleworking from home; you are given the space to develop yourself whilst giving value to your customers.

At University I studied Computer Science and Classical Civilization, hence, I came into the internetworking world with limited knowledge. I have been trained to the highest standard and hence I have been enabled to do my job more efficiently and achieve responsibility faster. From my point of view, not coming from a totally technical background, the training was very attractive. You are taught all the technologies required, in a hands on lab environment, using real tools and products. Soft skills such as presentations and team working skills are focused on too. The training was challenging and manifested a steep learning curve, but was also great fun, you get to meet new people and make new friends. The goal of the training is to prepare you to be able to help your team members, managers, and customers immediately after completing the program. You get the chance to obtain the standard of competence that would take years in industry. Within a very short space of time I have been able to achieve industry recognized qualifications such as the CCNP and CCDP (Cisco Certified Network Professional/ Cisco Certified Design Professional).

Day to day I work with my team to develop networks and implement internetworking technologies to solve customer's business and technical requirements/problems. The sort of projects you are involved with are interesting and diverse. One day you could be running through a demonstration with a customer to prove the technology involved or visiting a customer site and giving them a technical presentation, the next you could be enrolled on a course to learn about the latest innovation. I enjoy interacting with the different types of people, from fellow team members to customers. You need to be creative to deliver the solution with the best value in terms of solving their requirements. You also need to be confident in front of a customer and be able to justify the technologies in question. If I could summarise the key skills needed for the role of a Systems Engineer, they would be: teamwork, initiative, problem solving, creativity, commitment and drive, presentation skills and a fast-learning ability.

BROAD JOB AREA

Software and Ap

JOB DESCRIPTION

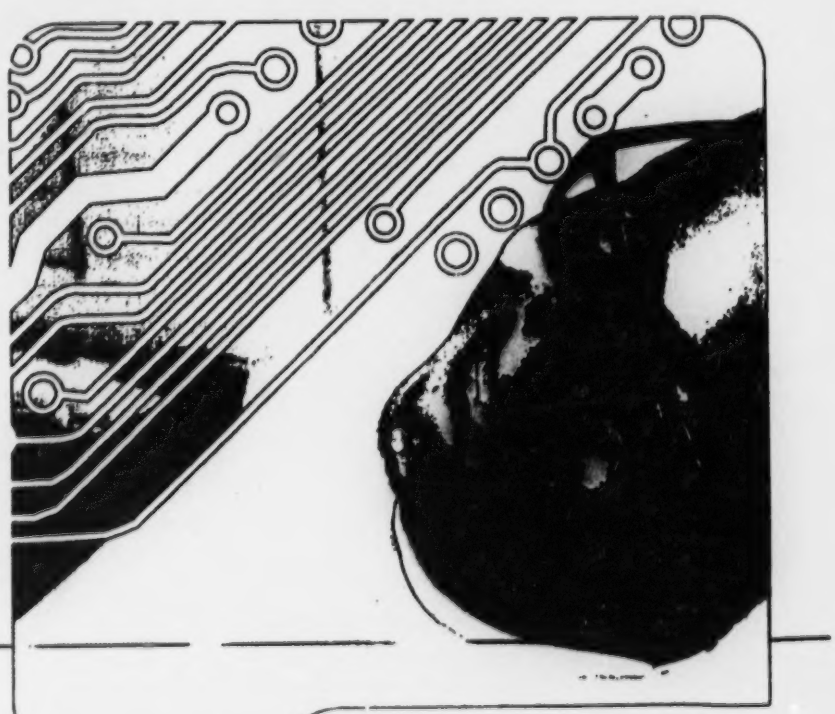
The Vision

Many of the exciting new IT possibilities rely on software to deliver the product or service. Specifying, creating, testing, installing and maintaining it is now the dominant area of development in bringing new IT systems to the market. Applications Developers are capable of working with colleagues to specify customer's requirements in software terms, then they translate them into efficient, reliable code. Technological expertise in one of the many development environments and application domains (from computer games to electronic payments) is vital, but the ability to understand client requirements is just as important. Programming is one of the best overall grounding for a career in IT. It opens the possibilities of moving into more specialist fields, analysis, design, project/team management. It is a good entry point for development into any or all of these domains. Some companies offer training programmes to graduates of all disciplines to enable them to work in this area.

The Role

In this kind of position the SW Applications Developer designs, builds, tests, implements and maintains applications to meet specific customer requirements using existing languages, D.B.M.S. (database management system), development tools etc. They also include the development of methodologies to carry out these activities. The Software Applications Developer understands a range of applications and how to transfer the customers needs into real and robust applications.

EXAMPLES OF JOB TITLES



plications Development

Applications developed include enterprise applications, e-commerce applications, management and enterprise information applications, embedded software applications in e.g. mobile phones and Enterprise Resource Planning (E.R.P.) systems in the business and industrial environments. The customer requirements must be understood, as well as the tools to transfer this into a robust application and develop the application in the most effective way. When developing business applications, the developer must gain a thorough understanding of the business processes and constraints. Knowledge of the human computer interaction (HCI) is also part of this role, this involves the human psyche, ergonomics as well as applications development. Examples of applications are: Internet ticket reservations; Corporation Management Information Systems which include all aspects of the business; the technology to transfer graphics or video pictures to a mobile device, and telephone billing systems.

The Lifestyle

Although in most cases the work is carried out in teams and in one location, it is also possible that teams work on multiple-sites and communicate via modern media-devices. These teams are often temporary in nature, put together to carry out a particular project. So it is important that people doing this job enjoy working in different teams. In the initial period this job requires a lot of technical tasks with the rest of the team but as time goes on more and more involvement with the business and customer environment is part of the job in order to demonstrate and implement the developed solutions or applications. Also, a lot of interaction is needed with other SW communities (companies, institutes and universities) to stay "up-to-date" with the technology.

Attending conferences and doing extra study courses might require travelling and people working in this area should also cultivate a stimulating "personal network".

TASKS ASSOCIATED WITH THE JOB

- Applying modern design methods and associated development tools.
- Developing the code and testing algorithms and/or real-time control aspects in a modular way of working that follows the planned structure.
- Analysing system routines/modules, performance, memory size, etc. of (embedded) technical systems (when applicable).
- Supporting project management.
- Building the System and the Sub-systems according to the design and the developed structure and modular set-up.
- Building prototypes of (parts of) the system.
- Co-operating with the Systems Architect and/or System Designer.
- Designing the module test(s), assisting in the design of the integration and installation test. Executing the system integration, integration testing and installation.
- Developing and/or applying a version control procedure, installation procedure and make a full documentation set. Adding relevant documents like release bulletins.
- Executing the technical introduction, the installation, final testing, system.
- Evaluating and arranging the Maintenance & Support.
- Specifying user requirements and functional requirements.
- Drawing up the plan of action for the structural design, the code development and other phases of the Software development cycle.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Operating systems (for e.g. PC, Workstations and Consumer Devices)
- Programming languages (Assembler, C, JAVA, etc.)
- Embedded Systems (e.g. in Disc-players, TV's, Game-players)
- Enterprise IT systems (e.g. Enterprise Resource planning)
- Internet applications (like E-commerce)
- Administrative and Financial systems
- Technical systems for machine control and other industrial automation
- Development tools for system and application software
- Database systems for data-exchange with the applications
- Network technology in real-time systems as well as multi-site environments
- Software engineering
- Software components technology
- Enhance and maintain the application

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Analytical
- Technical Orientation and Interest
- Problem Solving
- Attention to detail
- Communication
- Teamwork
- Planning & Organisation

Technical Skills

- Computer Programming
- Software Engineering
- Systems Designs
- Testing
- System Development Methods
- Embedded Systems
- System Development tools
- Business Requirements
- Project Management

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

With a number of years of experience the role could involve more intensive customer requirements analysis and user interface aspects (become e.g. a full Multimedia Designer/Developer) or extend towards the more scientific side to fulfil computer science roles in e.g. research environments.

A broadening of experience would lead to becoming a project manager/leader with a wider overview. This would be supported by extensive (project) management training. Also in the technical area positions like Systems Developer/Designer and Software-Architect would be future career path development opportunities.

These would also be based on the broader experience from various projects. A wide range of experience in the business is also a way to move into commercial functions in the I.T. area or become a manager and/or an entrepreneur.

THE TYPE OF PERSON THIS JOB WOULD SUIT

A person who enjoys solving technical problems (e.g. Computer programming) would like this job. Someone who can apply modern software design techniques to the solution of problems would also like it. In many parts of the industry a Bachelors degree is required for entry, although there are openings in some companies for people who have taken a shorter course, covering Computer Programming and/or Systems Design.

People who have a Bachelors degree, which includes Computer Programming and/or Systems design, could enter as Technical System Designers, SW Architects and Maintenance and Support Specialists.

Many companies offer positions to suitable candidates with degrees not including computer-related subjects. These jobs include an initial period of training in computer fundamentals and computer programming.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Intel, Microsoft, Nokia, Nortel Networks, Philips Semiconductors, Siemens A.G., Thales.

Ian
Systems and Software Engineer
Thales Missile Electronics UK

four years ago, I entered the Thales Group as a sponsored undergraduate. Today I develop software tools for data-processing and system models as a Systems and Software Engineer.

In each program, the teams are usually quite small. I see the whole of the program and everyone is involved with what everyone else is doing. Teamwork is definitely a source of motivation, knowledge, and an opportunity to develop one's skills.

The technology is cutting edge. Innovation and new ideas are generally well received. Creativity is cultivated and welcomed. The big plus for me about my job is the variety of work, even within my field. There is a great deal of variety, there is always a challenging new project.

When I started, the jobs that I was given were specific; and the level of supervision was what one would expect for someone just starting. Now I have an increased level of responsibility. I gained this by demonstrating to my supervisors that I can do the job. An idea of mine was well received, which allowed me to gain merit.

If everything stays as it is at the moment, I have no reason to leave. I can see myself here for some time.

BROAD JOB AREA

Software Archite

JOB DESCRIPTION

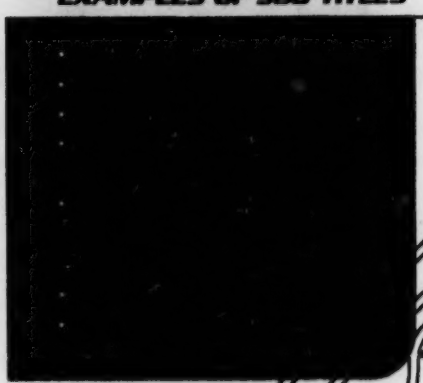
The Vision

In order to keep up with the dramatic performance advances of hardware, calls for software systems development to keep pace, to enable it to be exploited for commercial benefit. Software Architects conceive the operating software which brings hardware to life, then specify the overall structure which will support sustainable developments on it. These are the foundations of the software technology, which make up software technological solutions. This is a deep technological role, which involves software complexity but also the ability to work as a member of a team. Entry to a career is usually via programming in a specialist, software development environment, though the understanding of basic hardware functions is also important. Career development can lead to increasing technological specialisation in chosen fields and, or team and project management.

The Role

A Software (SW) Architect's main activity is analysis and high-level design. People in these jobs work on software technologies and solutions which are the fundamental blocks on which computer applications and telecommunications networks are built. SW Architects have to track the technical progress of a project to ensure compliance with or enhancement of the existing architecture or design. Depending on their particular role individuals may be called upon to carry out research, analyse, determine the structure (architecture), design, build, test, implement or maintain such software. This is a very technical job, which is basically concerned with programming or program design. However, it requires understanding of both hardware and software because, at this level, the software solutions are influenced by the nature of the hardware (e.g. microchips, computers, telecommunications equipment, individual devices such as a computer controller in a car). Analysis made by SW Architects and Designers would include studying the problem and the aim of the software to be developed as per the specification given by the customer or the marketing department. The analysis would include studying the relevant standards and the hardware documents.

EXAMPLES OF JOB TITLES



cture and Design

Then the SW Architect would aim to develop coherent, concise, accurate and clear to the customer, marketing and other development models. These models would depict the system and its environment e.g. user/software/hardware interactions, in terms of its static and dynamic elements. This requires creativity and the ability to abstract and invent elegantly simple models of complex entities.

It involves interviewing the customer or other sources of the job specification or of system knowledge (e.g. marketing department, potential users), and hardware developers or other subject matter experts who might range from bankers to musicians depending on the job to be done.

In the design aspect of the role the models mentioned above are enhanced to cover the systems constraints such as performance, programming language, operating system etc. For this aspect of the job an engineering mind is needed to develop a solution, which is both scientifically sound and meets commercial requirements such as TTM (time to market), Cost, Quality, Re-use. In order to implement, the models designed are specified in a machine executable language and validated for correctness.

The solution designed could be unique to one company or intended to be sold to many different customers. Examples of products worked on in this type of job are:

- Operating systems (e.g. Windows)
- Programming languages (e.g. Java)
- Software controlling specific devices (e.g. minidisc systems or a part of a motor car)
- Telecommunications network controllers.

The Lifestyle

Most people in this type of job tend to work in software development laboratories as part of a highly capable team. The size of the team would not only depend on the product, but also the stage of development. For instance, the development of the initial concepts of a product requires much smaller teams than the actual programming stage. More experienced people, who are often recognised experts in a product or technological area, could find themselves visiting customers to make sales calls, give presentations or solve problems; alternatively they might represent their company at large industry events.

TASKS ASSOCIATED WITH THE JOB

- Establishing market requirements or enterprise needs.
- Building architecture.
- Developing clear, concise, accurate and coherent models of the requirements.
- Extending analysis models to solve system constraints.
- Designing solutions.
- Designing and testing prototypes.
- Defining detailed specifications.
- Creating maintenance and implementation plans.
- Enhancing products.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Operating systems (e.g. Windows)
- Programming languages (e.g. Java)
- Embedded systems (e.g. Control functions of a mobile phone)
- Software to control specific devices like a minidisc system or the management of a motor car
- Database management systems to allow for creation, retrieval and management of large amounts of data (e.g. DB2)
- Systems for controlling large computer systems and networks
- Software to control the operation of games machines (excluding the games)
- Software to enable the use of the internet (e.g. Netscape)
- Application development tools
- Software to control the operation of a telecommunications network

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Technical Orientation and Interest
- Analytical
- Teamwork
- Communication
- Innovative
- Persuasiveness
- Business Acumen
- Relationships

Technical Skills

- Software Engineering
- Systems Design and Architecture
- Computing Systems Design
- Computer Programming
- Mathematics
- Systems Development Methods
- Technical Documentation
- Applications Design Concepts
- Re-use Create Design Patterns/Components

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

Probably starting as a programmer either developing or enhancing a specific product, the professional can develop into building the design and possibly the architecture of products or even families of products. At this stage the person would be a recognised authority on a particular product within the company and possibly even within the industry.

With some experience in this type of work there are also possibilities of developing a career along other lines such as:

- Understanding how to satisfy customer needs in the market place and developing requirements for new capabilities and products. Experienced people in this field could end up setting overall directions for the development of product families or even a whole industry sector.
- Project Management. This involves managing and controlling a team of developers. For successful individuals the size of projects being managed would increase and could end up directing the activities of a whole development laboratory.

THE TYPE OF PERSON THIS JOB WOULD SUIT

This job would suit a creative person with a desire and the ability to perform highly technical jobs to solve problems and develop software products.

People entering the industry are normally expected to have either:

- University qualifications in SW Engineering or other IT related subjects. These qualifications as a minimum will be at Bachelors level, but many entrants have higher level degrees

- Extensive successful technical experience in other related technical jobs such as computer programming or network design

This job suits people who are primarily interested in highly technical jobs in the IT industry.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, IBM, Microsoft, Nokia, Philips Semiconductors, Siemens A.G., Thales.

Polita H
Software Design Engineer
Microsoft

. . . am a Software Design Engineer on AutoPC, an innovative voice-activated car computer. I write applications for the AutoPC Address Book and the infrared . . transfer "squirt" for synching information to AutoPC from a portable device running the Microsoft Outlook messaging and collaboration client. I write C++ on a standard development suite for the Windows CE operating system.

As a Software Design Engineer, you will design and write codes, on which so many of people all over the world will depend. You have to be a master at C and C++, so your code runs fast, performs with precision, and is, among other things, creative, efficient, and robust. And you should possess superlative problem-solving skills and have both feet planted firmly in the future.

The big challenge for us is trying to define the new paradigm. Microsoft has never had a car computer before so we have to start from scratch to figure out what makes sense in a car. It's a whole new solution we're working on and we have a lot more variables to work with, such as a much smaller screen and a completely new technology interface.

As you might expect, the people working on the AutoPC have two major loves: fast cars and fast computers. To mix work with play, they often take out AutoPC test cars for weekend road trips. I really like that AutoPC is a small group where I get a chance to work on all aspects of development. Plus it's a mix of both software and hardware people working together to bring the world something that's completely new.

Our operating system has been renamed Windows CE for Automotive and we now work with 97% of the world's automotive entertainment suppliers, many of whom are working on releasing products using our operating system. I still work as a software design engineer in the group, but my team's focus has changed to researching what kinds of services are interesting in the car and how those services should be deployed to drivers safely. Recently I've been brainstorming new ideas and writing prototype software that we've demonstrated at industry trade shows. I've gotten to present my team's vision to a wide audience through speaking one-on-one with consumers and interviews with the press. It's really exciting to see the product taking off and knowing you were a part of it.

I plan to stay within Windows CE for Automotive and help the team deploy a successful set of services to our customers. My goal is to see my parents using and gaining benefit from a Windows CE device in their car.

BROAD JOB AREA

Multimedia Des

JOB DESCRIPTION

The Vision

The continuing rapid development of technology to present information in novel forms is creating vibrant, dynamic, new multimedia enterprises. Most information can now be digitised; text, sound, image (still and moving), touch and presented in exciting, innovative, artistic forms. The Multimedia Designer helps clients comprehend what information can now be created, how it can be accessed, including interactively, then builds and implements software systems to deliver it. As this field is developing rapidly, part of the Designer's role is to explain to clients, facilities and services that they might not have imagined possible, then help them to investigate how they could exploit them for business goals. Multimedia is one of the key growth areas of the next decade and will increasingly embrace entertainment and education, as well as business, as the world gets wired up. We can only surmise how careers will develop, but it will be an exciting growth area combining media knowledge with technical skills. Entry is possible through either media design or software experience and creativity is important.

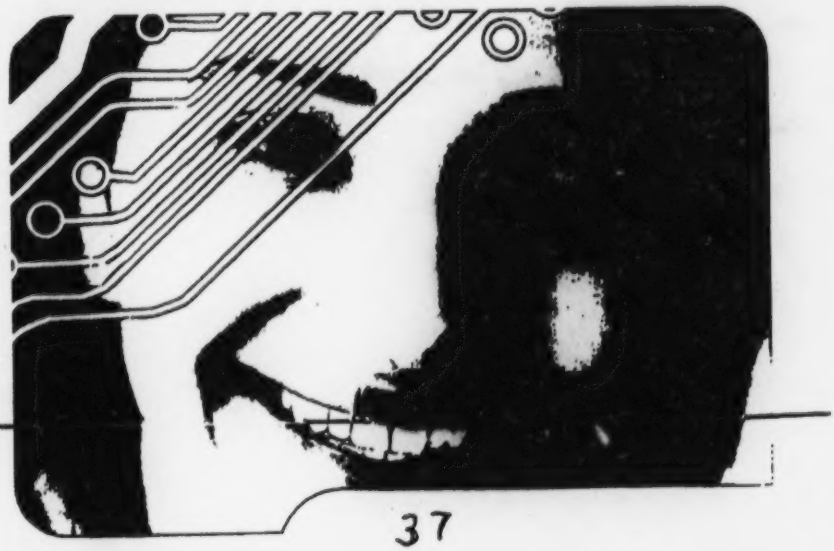
The Role

Having identified the available medium and proposed a solution, the designer then manages with customers, team members and external agents, the human factors and uses interfaces for visual impact.

The designer may create prototypes, simulations on virtual environments with various multimedia technologies to represent the proposed system. Alternatively they may re-design or adapt existing products to satisfy the multimedia requirements.

Planning co-ordinating and overseeing and overseeing acceptance testing, as well as integration and installation at the customers site, are all parts of the designer's role as well as training and customer support.

EXAMPLES OF JOB TITLES



The Lifestyle

Most people in this type of job tend to work in software development laboratories as part of a highly capable team, but this job also offers possibilities of tele-work via network facilities. Multimedia designers are very creative team members who give another vision to the customers' needs.

A high level of interaction is needed with the customers and the software communities (teams, universities). They must be willing to keep up-to-date on the state-of-the-art in human computer interaction and in audio, video, internet areas (e.g. by attending conferences or working with universities).

TASKS ASSOCIATED WITH THE JOB

- Analysing enterprise or customer's needs.
- Identifying, interpreting and evaluating requirements and specific constraints.
- Identifying available media.
- Designing user interfaces.
- Managing - with customers, team members and external agencies- interactive developments and integrating human factors and user interface for visual design.
- Creating prototypes, simulations or virtual environments with various multimedia technologies.
- Redesigning and adapting existing products to fit into multimedia systems.
- Creating or/and integrating media elements.
- Producing graphics, animation, audio, tactile, video contents.
- Identifying time and other constraints.
- Integrating, planning and co-ordinating acceptance testing, installation at the customer site with training and support.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Human computer interaction technologies (e.g. touch screen)
- Graphics, video, audio technologies
- Specific language for multimedia applications (e.g. HTML, Lingo, Java)
- Specific tools for multimedia applications (e.g. FrontPage, Visual Tools, Illustrator...)
- Operating systems, user interface design conventions and web client design conventions (e.g. Windows 95 style guideline)
- Software to enable the use of internet (e.g. Netscape)
- Email software (e.g. Exchange)

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Creative
- Analytical
- Relationships
- Communication
- Flexibility and Self Learning
- Technical Orientation and Interest

Technical Skills

- Artistic Knowledge
- Software Engineering
- Embedded Systems Knowledge
- Systems Design and Development Methodology
- Applications Design Concepts
- Networking Concept
- End User Interface
- Computer Programming

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

To move along the career path a graduate would need a few years of experience and also need a great deal of ability to:

- innovate, to create in a perpetually changing technical environment;
- to take a broad view of technologies and to use them in a project, and/or
- willingness to keep up to date technically.

This is a booming area where creativity will always be needed.

The technical aspect of the career path progress might be:

- Multimedia Programmer who is able to develop and implement elements in specific languages (e.g. HTML, Lingo, Java.) and use specific tools (FrontPage, Visual Tools, Illustrator...),
- Multimedia Designer, Multimedia Analyst who is able to gather data to identify various customers requirements, Multimedia Architect who is able to use Software and Hardware technologies (including networks, mainframe and PC client server, Internet.) and Multimedia Project Manager. Another step could be to provide technical support for other functions in the enterprise like communication and marketing to open up new market areas. A move into management could be another career development e.g. to become a Design Manager. A move into marketing or communication or training jobs would be yet another possibility.

THE TYPE OF PERSON THIS JOB WOULD SUIT

A creative person with graphic and artistic abilities who also have some interest in applying technology will enjoy these jobs.

Most people in this sector of the industry have one of the following backgrounds:

- Artistic studies from universities and art colleges (example: Web Graphic Designer). Entry jobs for this kind of person often include initial technical training.
- A more technical education such as a Bachelors degree or a shorter computer programming course (e.g. multimedia programmer, Inter/Intranet Audio, video engineering)
- Experience of employment in jobs with a creative background such as journalism, television, advertising (e.g. Web Producer, Web Creative Specialist)

JOBS OF THIS TYPE ARE TYPICAL IN

BT, IBM, Microsoft, Nokia, Philips Semiconductors, Siemens A.G. Thales.

Natasha G

BSc. (Hons) Applied Psychology & Computing
Bournemouth University, U.K., 1996
BT

While studying for a degree in Applied Psychology and Computing I focused heavily on the disciplines behind designing interfaces and systems that are easy to use and people friendly. After graduation, I managed to obtain a 7-month research post at BT labs working on the evaluation of a virtual world trial.

Still keen to be a part of something innovative and exciting, but also hoping to work on the development of products with a more imminent delivery timescale, I joined BT as a Multimedia Interaction Designer.

Much of the work is heavily customer focused, so you need really good communication skills. Although your 'customer' might be someone else in BT you still have to identify and evaluate their requirements and help to turn these into reality. Often the actual design work will be done by an external agency so your job is to offer design management and consultancy skills. It is important to brief the agency clearly in the beginning, to continually monitor their work and make sure that you are happy with the look and feel of the work and the portrayal of the BT brand.

In the two years since I joined BT, I have worked on some really exciting and challenging projects including British Interactive Broadcasting and an online education service for Primary schools. Now I am involved in the design management of two promotional multimedia websites for large scale sporting events, including the official website for Rugby World Cup '99.

You always have to be clearly focused on the end user when you are designing, who will they be and what will they expect from the product or service? And it isn't all about fancy design and pretty graphics, it's really important to design with the technology and platform in mind.

No one will want to wait 5 minutes for a website to download even if it's the most graphically wonderful website in the world.

I am expecting to be involved in some really exciting projects covering everything from e-commerce and Internet to futuristic virtual worlds and wearable computers.

BROAD JOB AREA

IT Business Cons

JOB DESCRIPTION

The Vision

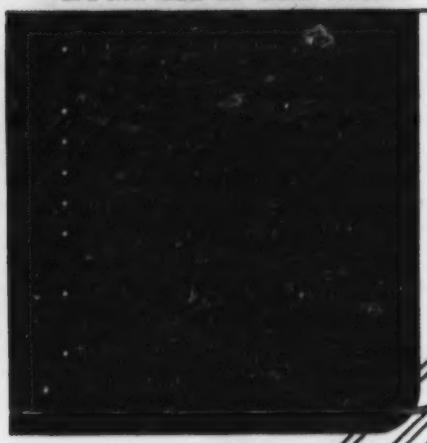
The Business Consultant is a person with good overall commercial experience, who helps clients develop I.T. solutions to further their business goals. Knowledge of business context, imperatives and drivers is as important as the potential of I.T. to address them. This is a hybrid role combining business acumen with technological experience. Initial positions are usually through positions in business systems analysis, gaining practice in understanding business processes, whilst learning how technology can be exploited to satisfy business needs. Some companies offer training programmes to graduates of all disciplines to enable them to work in this domain.

The Role

The I.T. Business Consultant is responsible for ensuring that business needs are met when developing and implementing I.T. solutions. He/she has understanding of the business strategy and the I.T. solutions required to support it. The person entering this type of job also requires understanding of I.T. industry directions and technologies and demonstrates this in ways which can be used to build the required I.T. solutions. As an example, people in these kind of jobs could be involved with work to understand the implications to the employer's business of modern e-commerce and internet technologies and then ensure that a solution is implemented to maximise the benefit to the business.

The I.T. Business Consultant is focused on analysing, planning and developing I.T. solutions that support the business needs of the firm. He/she also participates in business planning, business needs analysis and business risk assessment. The I.T. Business Consultant also acts as an in-house consultant working with the various functional areas of an organisation, providing advice and guidance on how to support the business operations through the effective use of I.T.

EXAMPLES OF JOB TITLES



The Lifestyle

Most people in this type of job work in the information management or application development part of a business organisation. They typically work in teams, in short-term or in longer-term projects providing application development and support services to the business. The work involves a great deal of interaction with various parts of the organisation, negotiating, solving problems, defining and configuring optimum solutions, and communicating these to business managers. In the initial phase of the career, most people in this kind of job have a supporting role in a project, but with increasing experience they get to play the leading role in various projects.

TYPE AND LEVEL OF SKILLS

- e-commerce and Internet
- Mobile telephony and networking
- Hardware technology (Computing/Terminals/Middleware)
- Application platforms (e.g. SAP R/3, Lotus Notes/Domino, MS
- SQL Server, Oracle)
- Modelling (e.g. Business, Data, Process)
- Service Solution building/creation & integration (per application service)
- Service Solution deployment
- Service Delivery (operations/support)

TASKS ASSOCIATED WITH THE JOB

- Defining business requirements for the I.T. solution.
- Defining I.T. strategy for the business (which might be, for instance, the best ways to capitalise on the latest internet or mobile phone technologies). Participating in business needs planning & strategy process.
- Identifying and defining opportunities to simplify, improve or redesign business processes using I.T. solutions.
- Analysing, planning, configuring and developing I.T. solutions.
- Overseeing and co-ordinating various aspects of the solution including information flow, data security, business recovery, system implementation, and change management.
- Defining and ensuring implementation of standards and processing across the organisation in support of the solutions.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

Behavioural Skills

- Flexibility and Self Learning
- Creative Thought
- Communication
- Persuasiveness
- Teamwork
- Strategy & Planning

Technical Skills

- Business Strategy Planning
- Business Requirements Analysis
- Process Improvement and Change Management
- Systems Design & Architecture
- Industry Knowledge
- Systems Development Methods
- Business Acumen
- Technology Trends

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

The entry position in this career may typically be that of a Business Analyst. More experience with the business and process work leads to positions which focus on developing the business (Business Development Consultant). Some years' experience in various business related I.T. projects is required for Project Manager's position. A broadening experience leads to work with I.T. on the strategic level (I.T. Strategy Consultant).

THE TYPE OF PERSON THIS JOB WOULD SUIT

This is a role for an experienced IT individual. It will suit a person who enjoys solving problems and who has a sharp customer focus and orientation.

A Bachelors and or Masters (first or second cycle degree) would be useful to enter this job role, however, the level and depth of the person's experience may be a deciding factor.

A person who likes working in a team, and writing and communicating with others with an interest in understanding business and how the business problems of the future will be solved with the help of technology like computers and mobile telephones. A person who thinks solving business problems would be interesting would enjoy this job.

People with third level qualifications in a business related subject (e.g. Accountancy, Business Studies, Economics or a technical subject (e.g. IT, Computer Science, Electronics, Mathematics) should consider this kind. People with more general qualifications in subject areas such as French/German/English, History, Geography... should also consider this kind of job.

A person with full time working experience in general business with a sound understanding of the methods and issues of one or more specific industries or previous IT experience of a more technical nature would also enjoy it.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Intel, Microsoft, Nokia,
Philips Semiconductors, Siemens A.G., Telefónica S.A., Thales.

Francois J
Ecole Supérieure de Commerce de Bordeaux, 1999
IBM Global Services, Paris, France

As a business school student, I was looking for a job which would give me the opportunity to combine both management consulting and Information Systems technical skills. I was hired by IBM to work on Customer Relationship Management and Business Intelligence - which allows clients to make use of computers to obtain key business information from their databases.

Everyday I work with clients. These days, I work for a large Insurance group. I go on with my technical training but attending a course on the product is absolutely not enough to really know it: you must have practical experience. At the beginning, I followed an expert and gradually became more independent. After two months we were working together. There is one thing I particularly appreciate in my work: Today differs from yesterday. Everyday, I learn and I create.

Very often, I have the opportunity to use my business skills to make the connection between users and the development team, and that makes me think that I am getting closer to my original professional goal: to become a multi-specialist consultant in the e-business world.
I work in a very "professional" environment but also in a friendly atmosphere. The ambience of a team is very important. The average age is around 30. After a long day, it is agreeable to go and make sport with colleagues who soon become friends.

An IBM "plus" is the opportunity to go overseas and/or to change jobs often. Also, being part of a world-wide team, we share our knowledge through our electronic network of Intellectual Capital.
I think that one of the greatest challenges for a graduate student is to choose the right activity and a good company. If I had to use an image, it would be the following: On which wave and with which board will you surf? Products, concepts, companies appear, disappear everyday. There are many opportunities to seize and as many opportunities to avoid.

During the past two years, IBM has given me the opportunity to work as: a software consultant, teacher, pre-sale consultant, project manager and a business consultant.

I am currently a Business Innovation Consultant dedicated to Customer Relationships Management and Business Intelligence. My customers are large multinational corporations and small companies.
Over the years I've worked for every major industry sector, at least once. I've been to the USA twice, to take courses, and I'm currently on mission to a small French Island in the middle of the Pacific Ocean for two months.

Be aware that all my work experience to date is not simply the result of opportunism!In order to reach my professional objectives, I established a long-term plan with my managers to align customer's needs, IBM objectives and my skills development. One of the most important lessons that I've learned from my experience is : What customers want is 100% pure pragmatic consulting. My mission is to help our customers to turn their vision into actions. Customers really need consultants that are able to understand their strategies in order to establish an action plan that aligns process, organisation and IT dimensions. Today, I'm able to take this challenge because IBM and I have been constructing my professional development since 1999.

I have two messages to convey:
Be aware of your own technical abilities and value in the market place. I believe that every professional must consider him or herself as an individual company and never stop from analysing the environment, anticipating the future and positioning for it.
Have fun! 8 hours a day, 5 days a week are long if you do nothing exciting! I believe enjoyment is a key factor for any professional achievement.

BROAD JOB AREA

Technical Support

JOB DESCRIPTION

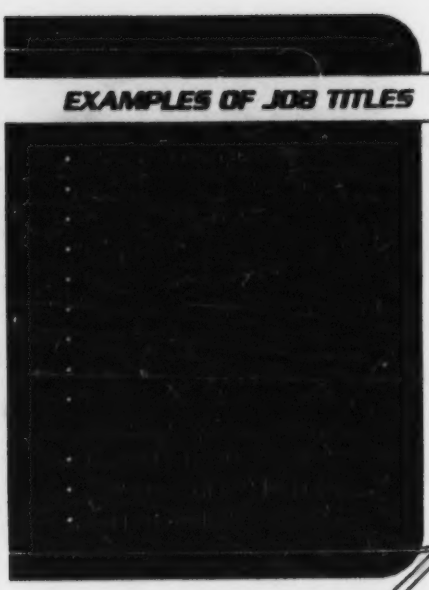
The Vision

Just about everyone today in work, and increasingly for leisure and pleasure, relies on accessing information via computers. With increasing complexity of computer systems, build up of inter-connected hardware and software modules, systems sometimes fail. Occasionally it is a genuine systems failure, more often it is user mis-understanding or operational error; whatever the situation is, it has to be resolved and access restored. Technical Support Staff specialise in identifying, analysing and fixing "faults" which prevent users connecting with their systems. As new facilities develop, Technical Support Staff train users in the enhancements and how to maximise their computer system's potential and usability. Customer handling and good inter-personal skills are as important as technical know how and the desire to investigate and resolve problems. Careers starting in Technical Support can form a sound basis for either enhanced business or technical development. This is a useful entry point for those who wish to enter IT, but have no previous experience.

The Role

Depending on their particular role, people in these jobs may be answering customer questions and concerns over the phone, or in person, either resolving the issues with the customer or referring the problem to other technical personnel. They may be responsible for the monitoring and tuning of the computer and telecommunication systems, for installing upgrades, and ensuring the day to day availability of any type of user applications, or computer and telecommunication systems or networks. They may be responsible for the operation of the computers, immediate problem solving and maintaining the service to the agreed levels. In some capacities they may be expected to contribute to user training and make recommendations about system upgrades.

EXAMPLES OF JOB TITLES



The Lifestyle

Most people in this type of job tend to work as part of a Technical Support team. They relate to vendors to assess technical products and to resolve technical issues. They also relate to customers with varying levels of technical skills and understanding. They are often under pressure to manage multiple requests with varying levels of importance and criticality. More experienced people are often recognised as experts in specific products or technology areas, and are called upon by management to give input to technology strategic decisions.

TASKS ASSOCIATED WITH THE JOB

- Installing, configuring and testing new operating software, software applications and software upgrades
- Evaluating, testing and installing hardware
- Monitoring and maintaining computer systems and networks.
- Document installation and configuration procedures, and maintenance schedule.
- Troubleshooting system and network problems.
- Interacting with users to assess technical problems and needs.
- Interacting with vendors to assess technology products and resolve technical issues.
- Managing system resolution with users.
- Researching technical solution alternatives and implement solutions.
- Operating the computer system and networks.
- Running network applications to support system and users.
- Answering, or forwarding to appropriate personnel, user questions and feedback.
- Documenting user issues and making recommendations for user training.
- Making recommendations for system improvement.
- Taking part in technical reviews, staff meetings and perform appropriate communication functions
- Supporting new applications
- Working in laboratories simulating customer networks
- Prioritising and managing several open cases at one time

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Workstations operating systems
- Mainframe systems
- Mainframe operating systems
- Network systems
- Network operating systems
- Internet software (Application downloads)
- Office software applications
- E-mail software
- Troubleshooting software
- System peripherals
- Telecommunication networks

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Communication
- Strong Customer Focus
- Social Skills e.g. to deal well with customer complaints
- Problem Solving
- Flexibility and Self Learning
- Technical Orientation and Interest
- Attention to Details
- Analytical
- Initiative
- Pro-active
- Organisational

Technical Skills

- Troubleshoot Technical Problems
- System Design Architectures
- Networking Concepts and Architectures
- Software Engineering
- Hardware Knowledge
- Technical Documentation
- Computer Programming
- Industry Standards
- Information Society Knowledge
- Data Protection Knowledge

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

Many Technical Support personnel start in technical call centres, answering user questions or referring them to more specialised technical departments. As more experienced is gained they may move to specialised help desk areas where they deal with more complex technical questions. As they continue to gain experience, they become more closely involved with the system, installing, configuring and troubleshooting hardware and software: starting with user applications and progressively moving towards system operations. As they gain expertise, they are involved with more of the planning and optimising of the system. With further education, they may choose to move towards careers such as network design and implementation specialists.

As the Technical Support person develops expertise and a professional network of business contacts, some will choose to become consultants. Many consultants tend to specialise in one or two vendor systems and will often obtain certifications from these vendors to increase their demand in the computer Technical Support market and also in order to meet customer and quality requirements.

Some people with Technical Support background may choose to migrate in the area of user training.

THE TYPE OF PERSON THIS JOB WOULD SUIT

A person who is fascinated by how technology works and likes helping people to fix problems with technology systems will enjoy this job. Technical support roles suit people who enjoy the challenge of supporting customers who may be unclear about the problem they actually have and require immediate support.

There is a great deal of flexibility over the entry requirements into these type of jobs. In general, educational level will determine at which level an individual can enter this job area. Once in this kind of job, progression to higher levels and different types of jobs will depend very much on ability and performance.

A person with school leaving qualifications could begin work as a trainee computer operator, helpdesk operator or trouble-shooter. To perform some of the other jobs within this profile such as Network & Configuration Management Specialists and Operations Analysts a person will need to continually update his/her technical knowledge and experience, on the job and by taking appropriate courses and getting more advanced qualifications as necessary.

Alternatively, a bachelors degree could be a pre-requisite for jobs such as Systems Programmer.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Intel, Microsoft, Nokia, Nortel Networks, Philips Semiconductors, Siemens A.G., Telefónica S.A., Thales.

Mark P
BSc (Eng). Hons Manufacturing
Systems Engineering and Management.
Kings College London (University of London), 1999
Nortel Networks

Many years in the education system had made me keen to get out and experience the dynamic marketplace. I had originally considered a further degree, however I felt that this could be done at a later stage.

Whilst attending one of the IEE recruitment fairs, I submitted my CV to Nortel and within two weeks I had been asked to attend an initial interview. Here, the human resources representative felt I was best placed in Technical Support. An assessment centre evaluation followed and I was accepted into Nortel soon after. The total time from application to acceptance was no longer than six weeks and I had secured my employment six months prior to the completion of my degree. This made me feel very secure about my future, and could really concentrate on my final six months of study.

The first two months were spent establishing my vigorous training programme, understanding the job role and processes required. I had actually been recruited to support Nortel's well-established carrier network switching product, the DMS. My degree in engineering had not taught me about telecoms but about the process of learning, thus, even though I was not technically knowledgeable I had the techniques of picking up new skills, and the ability to problem solve. This as vitally important when I had to get to know the industry as well as a product.

During my training I was assigned an excellent mentor who guided me though the technical and administrative issues that I came across. After a year of being mentored, I was then given the role to assist the in-coming graduates to take them through my experiences.

After a year of training on Hardware and Software in various parts of the world, these skills were soon put to use in solving customer queries and faults. This required being able to liase with customers to fully understand their issues, and then interpret if this was a fault or not. Our team now supports most of Europe for the DMS, including 24-hour Emergency and Business Critical cover.

In the second year of the Graduate Program, Nortel encourages studying other parts of the network, from Access, Low, Mid and High Capacity Transmission Products, Wireless, IP/Data and Enterprise Solutions. As a result I was actively involved in the migration of technical support for the UE3000 Access product range, from its existing group to our own, This required installation and project management expertise picked up from my degree.

The future of our technical support is now, not product based, but network based, thus re-training in customer solutions is the key to a successful support organization. Nortel have been very keen to expand all employees' skills in being able to support a customer's issue if the problem migrates from one product to another. This will manage their issue from start to finish, and ultimately make the employee extremely flexible in working from one product to another to narrow the fault down.

A technical support role requires extreme adaptability, from being technically competent in dealing with designers one minute, then being with customers and understanding the nature of their network and fault. This, ultimately, opens up a multitude of career paths for you in or out of the telecommunications industry.

I will probably stay in telecoms due to a personal interest in the industry, and the wide range of job functions available. I feel technical support gives you one of the best interactions, and with the dynamic changes going on currently in the telecoms industry, can set you up on a technical or business career path.

BROAD JOB AREA

Product Design

JOB DESCRIPTION

The Vision

The power and functionality of contemporary hardware and software means that I.T. products are becoming increasingly sophisticated and complex. The Product Designer works with colleagues to specify, design and build new artefacts which range from next generation hand held personal information appliances, to next generation computers. In some cases the work is carried out in a research or experimental environment. Team working and the ability to model and simulate novel situations are important. This is a deep technological role involving microelectronics for those engineers who wish a career at the forefront of technology, to exploit it for novel product development.

The Role

The Product Design Engineer often uses highly sophisticated computer based simulation systems to prototype new hardware devices and may also be involved in the design of software to enable the simulation or to enable the hardware devices to work in a complete system. Programming at this level requires a much deeper understanding of the architecture of electronic devices than say an Applications and Software Developer who would concentrate more on implementing business processes or user interaction. This job role requires knowledge of microelectronics.

The Lifestyle

The Product Design Engineer has a collegial responsibility as a member of a group. The Product Design Engineer is responsible for the quality of his/her own work. Since the Product Design Engineer work is highly technical contact with customers is not so frequent at the beginning of the career.

EXAMPLES OF JOB TITLES

TASKS ASSOCIATED WITH THE JOB

- The work includes planning of hardware, both prototypes and specific parts. Further on, the work also includes design and testing of subsystems and prototypes.
- A Product Design Engineer is as a member of a group responsible for testing and integration of new products.
- The work requires good knowledge of how to select the proper materials and components.
- Identification of model performance requirements and specific constraints is also an important task in product design.
- As a new Product Design Engineer it is very important to continuously train and build-up the required expertise.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Analogue/Digital Circuit Design
- Signal Processing
- High Frequency Planning
- Analogue/Digital Electronics

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Analytical and Creative
- Teamwork
- Flexibility & Self Learning
- Commitment to Excellence
- Communication
- Problem Solving
- Decision Making
- Professional Attitude

Technical Skills

- Electronics Theory and Know-how (analogue / digital)
- Digital Design Skills
- Hardware Development Process
- Production Technology
- Knowledge of Quality Standards
- Systems Development Tools
- Solid State Technology
- Knowledge of Physics
- Knowledge of Mechanical Engineering

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

A Product Design Engineer has many career opportunities. One of the opportunities is to work in the highly technical field as a theorist, researcher or inventor. The work is often done in multi-disciplinary project teams. In Product Design there is also the opportunity to advance into a managerial or project leadership position. Many Product Design Engineers decide later in their careers to be independent consultants or even start their own consulting firms.

THE TYPE OF PERSON THIS JOB WOULD SUIT

People who look logically at a technical problem to find a solution, can form relationships to support and plan the way a team will work to solve a problem will enjoy this job.

To enter as a technician a two-year course covering testing, systems design and architecture and computing system design fundamentals would be needed.

All other jobs such as Systems Implementation Engineers and Test Specialists would need a Bachelors degree or more (i.e. first cycle or second cycle degree).

JOBS OF THIS TYPE ARE TYPICAL IN

BT, IBM, Microsoft, Nokia, Philips Semiconductors, Siemens A.G., Telefónica S.A., Thales.

Michael Z
Dipl.-Ing. (FH).
Siemens AG, Germany

I am already working in the ASIC development for more than seven years, an area in which we construct optical networks with a complex switch and a wide variety of functions. The spare parts will be inserted into appliances also produced by Siemens. My job is never boring. There is always the possibility to produce something new without having to change completely. Just recently I have been made Head of my own unit with six employees. Beside the technical control I am also responsible for the co-ordination of the schedule, the cost controlling and to establish the contact to many internal colleagues.

As so many different people, even different personalities meet at Siemens, team spirit and a sure instinct are required. I have learned, how important it is to communicate. Through communication you often learn the most essential things. In general, we think in a very team-orientated way. For example, we are discussing all together about which knowledge we want to expand and we are searching together for the best course in the training program of Siemens. Because the more you know, the happier you are in your job.

BROAD JOB AREA

Integration & Test / Im

JOB DESCRIPTION

The Vision

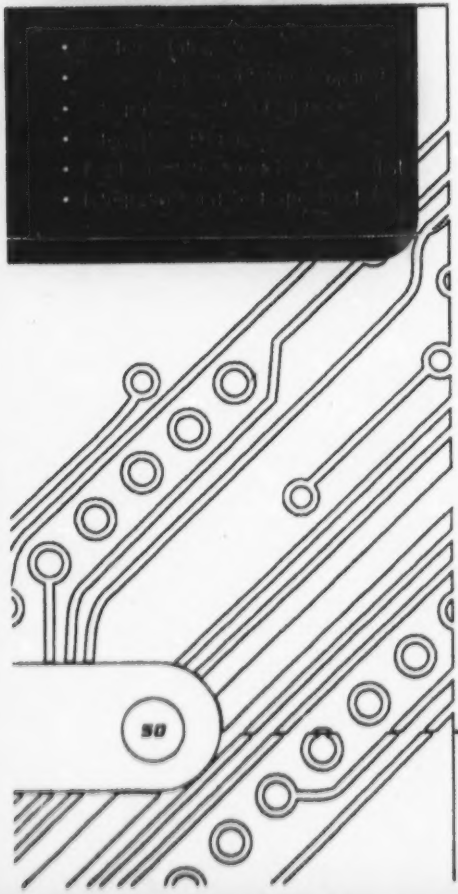
We are all embarking on an information revolution, driven by the convergence of computing and communications technologies onto common components; the international telephone network is the largest, most complex artefact, ever devised by man. Telecommunications are a key component, developing at unprecedented rates; testing existing and emerging technologies to ensure fitness for purpose are vital tasks. The Integration and Test/Implementation and Test Engineer is a pivotal figure in these developments and has opportunities to specialise in both telecom equipment and testing techniques.

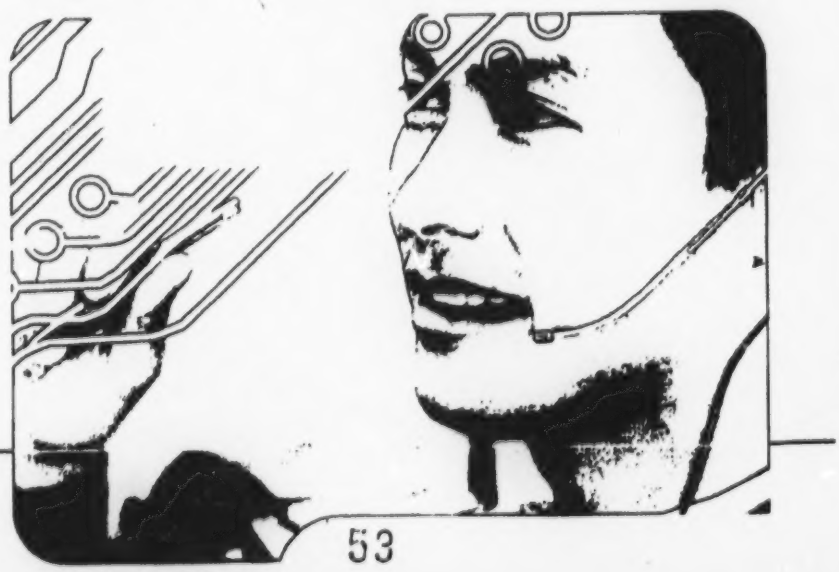
The Role

The Integration Engineer needs to work very closely with the design and development teams to ensure that they have a good understanding of the product or system that is being created. Throughout integration and test, a close relationship will be maintained with the designers/developers or suppliers of the various component parts as the Integration Engineer will need to ensure that changes are made in the various components that will allow them to work together as intended. The Integration Engineer will also need to understand the customer requirements as part of the role is to design a set of test scenarios to check that the product /system meets these requirements.

The Implementation Engineer fulfils a similar role, but, whereas the Integration Engineer proves the system works as intended at the end of its product development, the Implementation Engineer ensures that it functions at the operational site through its installation and commissioning. There is also the need to provide support while the people who will be ultimately responsible for operating the product / system learn about it. This means that the Implementation Engineer will be responsible for undertaking the hands-on-training of these people and may be responsible for managing the training programme of the operational staff.

EXAMPLES OF JOB TITLES





Examples of products or systems for integration and test / implementation and test include:

- A new telecom billing system into an existing telecom network, which will include systems that manage the operation of the network and systems that are used to take customer orders
- A new platform to provide telemarketing services
- A new platform to provide multi-media services
- A new platform to provide Internet services
- A new platform to provide mobile telephony.

The Lifestyle

People work in highly capable teams and initially the job requires a number of technical tasks with the rest of the team and the design and development teams. There is then increasing involvement with the customer as a major part of the work is to implement the solution in the customer's environment to ensure that the product / system provides what is required by the customer.

FACTS ASSOCIATED WITH THE JOB

- Organising, managing and executing integration on the development and operational sites.
- Organising, managing and executing migration tests on the development and operational sites.
- Configuring the product / system to meet customer needs.
- Designing and running representative performance tests to prove capability.
- Estimating the amount of work required of the integration / implementation team.
- Co-ordinating the actions of the different specialists participating in the project.
- Assuring that the product / system functions as defined.
- Participating to transfer knowledge to the production process.
- Participating in training the customer.
- Specifying the end-to-end tools for system integration.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Operating systems
- Skills relevant to the business area where the system is being deployed e.g. in telecommunications he/she will need to have an understanding of telecom standards and networks
- Database management systems (e.g. Oracle)
- Network Protocols and Internet Protocols (e.g. Http, INUP, INAP, ISUP, X25, C7, TCP/IP)
- Test tools and methods
- System engineering methodology and tools

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Ability to successfully manage relationships with customers, suppliers and colleagues
- Analytical
- Creative
- Attention to Detail
- Teamwork
- Communication
- Problem Solving
- Information Handling
- Initiative
- Delivering to Deadlines
- Planning and Organisation
- Leadership
- Flexibility and Self Learning
- Commercial Awareness
- Commitment to Excellence

Technical Skills

There is not a requirement to have all of the following skills, as some will be developed in the role. Skill requirements will also depend on the type on the work/business area involved.

- Basic Electronics Theory and Know-how (analogue / digital)
- Basic Hardware Knowledge
- Basic Software and Embedded Systems Knowledge
- Computing System Design Fundamentals
- Electrical and Physical Effects
- Evaluation of Hardware Requirements
- Knowledge of Configuration Methodologies
- Hardware Development Processes
- Integration Concepts
- Knowledge of Product Creation Cycle
- Reliability Engineering
- Performance Engineering
- System Design System Management Concepts
- Testing
- Knowledge of Verification Types
- Application Design Concepts
- Software Development.
- Computer Programming
- Knowledge of Change Management

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

Often people aim to become an Integration Specialist because of their like to see a total product coming together. Other roles and opportunities include Integration Engineer, Team Leader, Project Manager, Technical Consultancy, Sales and Marketing.

THE TYPE OF PERSON THIS JOB WOULD SUIT

A creative person who has a holistic approach to the solution of problems, is able to get on well with others to lead and to manage a team will enjoy this job.

A first cycle degree is a minimum entry requirement of this type of job.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, IBM, Intel, Microsoft, Nokia, Philips Semiconductors, Siemens A.G., Thales.

Ivan
B.Sc. (Hons) Applied Physics
University of Limerick, Ireland, 1997
Intel

Before joining Intel, I achieved an honours degree in Applied Physics from the University of Limerick. This qualification gave me a good grounding both in semiconductor physics and computing skills.

The first two and half years I spent at Intel were as part of the Factory Automation department, which was responsible for all the computing requirements of Intel's largest chip fabrication plant outside of the US. My responsibilities included the installation and support of various data analysis tools, database administration and systems management. This position exposed me to a number of computing platforms including Windows NT, VMS and UNIX and the process of gaining proficiency on these systems was achieved through the multitude of training courses and the on-the-job training opportunities which were available in Intel. This significantly strengthened my overall skills base. In 1999, I spent three months working in Phoenix, Arizona, learning the intricacies of a new yield analysis system and then returning to Ireland to install the system there. This was a fantastic opportunity to work in another country.

Since Intel is a globally dispersed company, you always find yourself working with colleagues in other countries, drawing on their knowledge and contributing to the international team. Meetings are held on line, over the phone, by video conference and of course, face-to-face which presents many travel opportunities.

I spent a number of months after this working on introducing emerging technologies to the factory environment. This included developing a WAP interface to the factory control system, allowing factory engineers to access critical information from a mobile phone.

Since then, I have spent the past year as part of Corporate IT with Intel, in a group which is charged with investigating new technologies and developing prototype and proof of concept applications for possible deployment within the enterprise. The majority of this time has been on developing and implementing a peer-to-peer content distribution system. This has allowed us to distribute large multimedia files across the corporation while making most efficient use of the network bandwidth available. This development has given me the opportunity to present at technical conferences, travel to various Intel sites and meet many peers who are working on innovative technology. This has proved to be the most challenging position I have held since joining the company, encouraging me to learn new skills and develop existing ones.

Intel gives me the chance to see projects through from the beginning to end, learn new skills and develop my career. It provides a constantly challenging and interesting work environment and the training available covers everything from the most technical to the more people oriented, such as presentation skills and interviewing techniques. The people I work with have been extremely helpful and open, giving me the opportunity to manage my own career and develop my skills. Overall, Intel is a great place to work!

BROAD JOB AREA

Systems Speciali

JOB DESCRIPTION

The Vision

Clients' commercial information needs change quickly, as business develops to respond to competition and new markets. The Systems Specialist works with customers to enhance their systems, to support emerging business requirements. Often specifications are worked up in competition against other suppliers. Systems Specialists have to be aware of how to exploit hardware and software in a cost effective manner to satisfy customer requirements. There is a need to inform potential clients of new facilities that technology affords, to develop novel products and services which could expand their operations. This is a hybrid role, knowledge of the business context and how to deal with customers is as important as technical know-how. Career development can follow either an increasing business oriented route to helping set IT strategy, or deeper into the hardware and software as a technological specialist. Some companies offer training programmes to graduates of all disciplines to enable them to work in this domain.

The Role

The Systems Specialist designs computer system solutions for customers from existing hardware and software products. The solution is designed to meet the customers requirements and since often the customer is seeking proposals from more than one supplier the Systems Specialist needs to ensure the design is cost effective and produced to tight time scales.

Computer systems often comprise many diverse products such as processors, networks, system software and application software. The Systems Specialist will be a recognised expert in a subset of these products and will often work in a team with experts in other areas to produce a complete IT solution for a customer. For complex projects this team may be technically led by an IT Architect or Systems Integration Specialist. The Systems Specialist will often use tools and methodologies to manage and design these solutions to help insure a quality design.

EXAMPLES OF JOB TITLES

The Lifestyle

By meeting with customers and seeking to understand their requirements the Systems Specialist will often learn much about how different industries and customers operate. As an expert the Systems Specialist is often called upon to educate others via presentations and workshops. Maintaining these high levels of expertise requires frequent self study, training and reading of computing magazines.

TASKS ASSOCIATED WITH THE JOB

- Analysing the customers' IT requirements to determine the best product selection and configuration. The best solution will be based on providing the required features and performance at an acceptable cost and available to meet the customers time scales.
  Task Example: *A Public Sector Organisation has written an operational requirement (O.R.) document (sometimes comprising 100+ pages) which defines the function, features, performance and other requirements of a new computer system to run a Human Resources application. The S.S. reads the O.R., clarifies uncertainties with the customer and then determines what size and configuration system meets the requirements at lowest cost.*

- Responding to customer requirements by giving presentations and preparing formal proposals.
  Task Example: *A Retail customer needs to put in place a new network linking all it's branches, offices and warehouses. The S.S. will asses the requirement, prepare a presentation and then present to the customer's decision making team the proposed solution in terms of technology and products. The presentation will also demonstrate why the proposed solution is better than competitive solutions. The S.S. will also produce a document which details the technical aspects of the proposed solution. The ability to effectively manage the network is likely to be key and the S.S. will need to understand the types of problems that may occur and how management tools can be used to detect, report and manage these problems.*

- Providing advice and guidance on the use, operation and design of systems or solutions using specific products. This could be by writing papers or reports, answering questions or demonstrating how a program works.
  Task Example: *A Bank wishes to analyse its customer data graphically to more easily spot patterns in the data. The S.S. designs and implements a proof of concept demonstration to convince the customer that the proposed products solve this problem. During the demonstration the S.S. explains how the various features of the solution are used. If high availability is a requirement the S.S. will need to consider the appropriateness of different techniques (RAID, Mirroring, Data Replication, hot standby etc.) and recommend the best solution.*

- Designing and running benchmarks to prove systems capability. A benchmark is a measure of system performance at a given, repeatable workload.,
  Task Example: *A University is developing a numerically intensive program for analysing fluid turbulence. The program takes weeks to run and the customer requires a system that delivers answers in hours. The S.S. determines the feasibility of running this program in parallel on many computers at once, he engages a programmer to make changes to allow this to happen and then designs a series of tests that can be run to show how performance improves as processor power and the number of processors increases. He then runs the tests to determine the optimum system configuration.*

- Using sizing and designing tools to determine appropriate product configurations.
  Task Example: *An Insurance company wants to start trading on the Internet. Your company is proposing an e-commerce solution. The S.S. uses a purpose designed sizing tool to capture information about the number of concurrent users, transaction size and complexity, and data volumes to profile the expected workload. Based on the output from this tool and the S.S.'s experience he is able to design a suitably sized configuration.*

- Planning, configuring, customising, and tuning these products for customers.
  Task Example: *A Manufacturing customer has purchased a pilot stock control system from your company and requires assistance in deciding the optimal physical database design and configuring the database to ensure good performance. The S.S. performs this work and uses performance monitoring tools to determine if any configuration parameters need changing or new index's need to be created.*

- Designing, organising and delivering product awareness, skills transfer and product education sessions to other technical specialists in your company and your business partners.
  Task Example: *As an S.S. working for a manufacturer or software vendor you will ensure that those companies that resell your product are kept up to date with product changes and have the necessary technical expertise to efficiently sell your products.*

- Working with Sales Specialists to assist in meeting your own companies' business objectives.
  Task Example: *Your salesmen will have specific quota and time scale requirements. In determining the best technical solution the S.S. needs to*

balance the customers requirements with his business's sales requirements to ensure his business continues to be successful and can continue to service customers. The S.S. will meet regularly with his Salesmen and will probably call together on the customer.

- Working with Integration and Implementation Specialists and software and Application Developers to appropriately size work efforts.
  Task Example: *Many customer requirements cannot be met from standard products. If the bespoke development activity is large then the opportunity will probably be led by a Software and Application Developer or Integration and Implementation Specialist. If it is small then the S.S. will meet with these specialists to design and scope the development activity.*

- Working with Project Managers to derive appropriate time scales and costs.
  Task Example: *Project Managers need input from S.S.s to determine the resources, size and time scales of any major proof of concept, benchmark, bid implementation integration or development activity.*

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

The Systems Specialist will have an in depth understanding of products, offerings and services within their speciality. Some of the major specialities are:

- Commercial computer systems e.g. UNIX, or NT based
- Parallel High Performance computers e.g. Cray Super Computers
- Technical Workstations e.g. graphical visualisation
- Sub-systems such as disk, processors, memory, i/o adapters
- Local Area Networking e.g. routers bridges, and protocols such as Transmission Control Protocol (TCP)/ Internet Protocol (IP)
- Wide Area Networking e.g. X25, packet switched networks
- Operating Systems e.g. NT, UNIX
- Databases e.g. RDBMS (e.g. Oracle), Hierarchical
- Middleware such as message queuing and transaction processing
- Internet application enablers such as web servers, fire walls
- Applications such as Human Resources, Manufacturing Planning, Decision Support, Call Centre, Computer Aided Engineering.

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Analytical
- Creative
- Flexibility and Self Learning
- Leadership
- Commitment to Excellence
- Communication
- Teamwork
- Relationships
- Planning and Organisation
- Technical Orientation and Interest
- Persuasiveness
- Mentoring
- Business Acumen

Technical Skills

- Computing System Design
- Computer Systems
- Systems Management Concepts
- Database Concepts
- Networking Concept
- Systems Design
- Integration Concepts
- Applications Design Concepts
- Hardware Knowledge
- Software Engineering
- Mathematics
- Statistical Analysis

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

As a young Systems Specialist the world of IT is at your feet. It is one of the most varied and exciting roles within IT and enables a wealth of career opportunities depending on your personal mix of technology interests, business interests and personal skills.

If the lure of technology as an end in itself is your goal, moving into Systems Integration and Implementation or Software Development is a well established option. If using IT to solve business problems is more exciting then Consultancy, Business Analysis, or Project Management will appeal. If your vision is more global and you are keen to direct product development or identify new markets then your Systems Specialist training and experience will be extremely valuable in Product Management and Marketing. Lastly some Systems Specialist's find the excitement of winning a major order gives them such a buzz that there is no alternative but Sales - and having a good understanding of the product you are selling is a great help.

THE TYPE OF PERSON THIS JOB WOULD SUIT

This job will suit people who have ambitions in either the purely scientific side of the industry, or those who would prefer to hone their technical skills before moving into business or organisational management. Either way you will need to be creative, able to solve problems of a complex nature, work on your own, but more often as a part of a team. A first cycle degree is a necessary entry qualification for this job.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Microsoft, Nokia,
Philips Semiconductors, Siemens A.G., Thales.

Sinead H
Bachelor of Commerce Degree
University College Cork, Ireland
IBM

Before joining IBM, I did a Bachelor of Commerce degree at University College Cork, majoring in Management Information Systems. While there, I set up and ran a music school, teaching the piano and baroque music to children at weekends.

After graduation, I worked in Munich as a chef for the summer season, and then joined IBM in London as a trainee project manager. I was thrilled to be offered so many opportunities to develop my skills, and was continually impressed by the calibre of people I was working with. My first assignment was as an Early Programme Support Manager at IBM's Hursley laboratories, where the messaging software MQSeries and the transaction monitoring software CICS were developed. These products allow customers to write applications that handle things like financial transactions in a highly reliable and efficient way. A bank would want all its cash machines to stop working just because one computer had a fault! In this and in later roles, I had the training and support to become a technical specialist. In my current role as a Systems Management specialist, I get to build on these technical skills while using my language skills as well. I spend most of my time talking to customers and helping them use programs that enable their computer systems to look after themselves without requiring people to look after them every day. IBM is a global company, and although I am based in London, I have been fortunate in enjoying lengthy assignments in Rotterdam and in Frankfurt.

I like working for IBM because it is an international company where although individuals are challenged to take responsibility for their work, there is always a strong team to provide backup support.

When not puzzling through technical problems, I enjoy travelling with friends or training for my next running trip. In December, I'm hoping to beat my record at this year's Honolulu marathon in Hawaii.

BROAD JOB AREA

ICT Marketing M

JOB DESCRIPTION

The Vision

A fundamental part in the ICT Industry is to detect what it is that customers and the market needs, and to translate these requirements into services and products which answer these customers' needs, while providing benefits to the company at the same time. Whether the product is hardware or software, the ICT Marketing Manager is a very important part of an ICT firm. The ICT Marketing Manager has responsibility for every aspect of a particular product or family of products from development to release, to the market place, combining business and technical aspects of the products.

The Role

An ICT Marketing Manager controls the life cycle of a product or family of products, executing many activities related to it, from bringing a new product to the market, to managing it, in collaboration with external providers, subcontractors, other company's experts in Engineering, and Sales for example.

The Lifestyle

Often, marketing managers or product managers are part of a bigger marketing team, where they co-ordinate the external promotion of the product with the sales force e.g. via advertising, mail shots, seminars and other events. They are usually the ones responsible for the revenues from the product they manage. If the product achieves its revenue objectives then the Marketing or Product Managers will often be rewarded by a bonus. Successful marketing managers spend a significant time building relationships and influencing senior business managers and customers as well as senior designers and architects for their products. They spend a lot of time in workshops, conferences, etc, sharing their ideas with others. They also spend a lot of time with customers to define jointly product plans and roadmaps for ICT marketing.

EXAMPLES OF JOB TITLES

TASKS ASSOCIATED WITH THE JOB

- Determines customer's needs and wants
- Product pricing by specifying the research needed to obtain market information
- Makes recommendations on the nature and scope of present and future product lines by appraising new product ideas and
- Makes recommendations on product or packaging changes.
- Assesses market competition by comparing the company's product to competitors' products.
- Provides source data for product line communications by defining product marketing communication objectives
- Obtaining and building product market share by working with sales director to develop product sales strategies
- Assesses product market data by calling in to meet customers with his/her sales people in the field and by evaluating sales call results.
- Provides information for management by preparing short-term and long-term products sales forecasts and special reports and analyses;
- Answers marketing related queries
- Facilitates inventory turnover and product availability by reviewing and adjusting inventory levels and production schedules.
- Brings new products to market by analysing proposed product development programmes; preparing return-on-investment analyses; establishing time schedules with engineering and manufacturing.
- Introduces and markets new products by developing time-integration plans with sales, advertising and production
- Determines products pricing by using market research data; reviewing production and sales costs; anticipating volume; costing special and customised orders
- Completes operational requirements by scheduling and assigning employees; following up on work results
- Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- All technology areas, which relate to the ICT products and services are associated with the job.

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Communication
- Creative
- Business Acumen
- Customer Orientation
- Flexibility and Self Learning
- Initiative
- Strategy and Planning
- Relationships
- Commitment to Excellence

Technical Skills

- Marketing Mix (Product, Price, Place, and Promotion)
- Business Strategy Planning
- Project Management
- Commercial Vision
- Integration Concepts
- Technology Trends
- Technology Product Knowledge (depending on the area of the market they work, hardware, software, communications ...)

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

The career path would normally start as a trainee Product Manager, or start as a cross profile, with professionals coming from more technical areas (Engineering, etc), with a technical background. When they are consolidated Product Managers, their career could develop to Project Manager, Marketing Manager, or to more customer-oriented areas, such as Sales, Pre-Sales, IT Consultancy, etc.

THE TYPE OF PERSON THIS JOB WOULD SUIT

This job would suit a person who enjoys combining 'technical work' with market a orientation or business awareness to his/her job. The jobs requires and enables the person working it to develop a global vision which encompasses the whole firm in which she/he works.

A person who likes working in a team, as well as writing and communicating with others with an interest in understanding how business works and in business strategies, would be good at this job. A person who is concerned with how the business problems of the future will be solved with the help of technology like computers and mobile telephones would be interested in and would enjoy this job.

A business or marketing bachelors degree (first cycle degree) would be the usual entry requirement for this type of job. Experience in marketing would also be an advantage. A person with a technical background and a Masters in Marketing or an MBA (Masters in Business Administration) would also have the necessary qualifications. The level and depth of a person's technical knowledge, business awareness and experience would be the decisive factors for entry to this job.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Intel, Microsoft, Nokia, Nortel Networks, Philips Semiconductors, Siemens A.G., Telefónica S.A., Thales.

Marta J
Degree in Electronic Engineering
Telefónica S.A.

My father and my uncle are Electronic Engineers, so my home was full of books about antennas and things like that. I could see how exciting was the ICT sector. Also I realized that there were so many opportunities to work that when I decided what I wanted to study, I chose Electronic Engineering as well. I enjoyed studying for my university degree, much more than I thought. I liked above all transmission, I mean how the information arrives from one point to another.

As I was studying, I started to work as trainee for a Company. I was a Help Desk Operator. It was hard. I think that this is the best thing that a student can do. Because one can see what it is really happening. University is sometimes too much theoretical.

Once I finished my degree in Electronic Engineering, I did other kind of job: software development.

After this period I joined Telefónica Group, at the Services Development Department (Telefónica Móviles, the Mobile Phones Telefónica Branch). I began giving support to Special Projects and after that I participated in Services Development. The most interesting project we made was a "Corporative Telephony System". We developed a service that integrates all enterprise's mobile phones with all enterprise's basic telephony leaving an only numbering plan. This project was a success. It has been implanted not only in Telefónica Group, but in thousands of enterprises.
While I was working in this project, I discovered that I preferred Management to Development and that I wanted to work with Data and Internet. So I began to work at Marketing Department.
Why do I prefer this department? Because one has a broader vision of the enterprise. One interacts with all departments. And also because one does not have a deep knowledge about a special subject, but one knows generally about many.

That is why I decided to be a Product Manager (P.M.) at Marketing.

As PM I have participated in the next projects:

Migration to new functionalities. It implied a modification process of our customer's service.
Creation of access services to Internet to Small and Medium Enterprises. My tasks were to analyse proper hardware, to do the business case, to give training to sales channels, to decide who are going to sell and to distribute these services and to analyse distribution channels.
Now what I am doing in Telefónica Data España is a project about VPN (Virtual Private Networks). RPV are a real necessity that our customers have. It is rewarding to create products that they are really useful.

I analyse and supervise customer's offers. I train sales people about products that I am in charge of. I think about what I want my product to be in 3, 6, 9 months and so on. I punctually give information about how many customers we have, how many we want and what we can do to have more. I compile and analyse all kind of useful information for my job.

I enjoy very much working as Product Manager. I have a global perspective of Telefónica Data España. I can see very well all areas involved in my product.

From my way of thinking, the more important skills to be a P.M. are: Relationships (basically, Diplomacy and Tact), Communication, Analytical, a future vision and also it is necessary to have a technical base.

After 5 years working as P. M., my personal experience is very positive and rewarding. I have grown up not only professionally but even personally.

ICT sector boosts something intrinsic to human being: Communication. Developing ICT technology benefits society in several ways, for example:
Parents in USA can see and talk to their son in Australia. Or the possibility to work at home: telework. It is not only cheaper for the enterprise but even it is more comfortable to parents.

At my leisure time, now I am learning to play piano. It is a dream from my childhood. I also belong to the theatre's group of Telefónica "Mojiganga". We rehearse Saturday mornings. Now we are preparing a play about 5 persons trapped in a lift.

BROAD JOB AREA

ICT Project Mana

JOB DESCRIPTION

The Vision

The ICT industry finds itself in a highly competitive environment that has to be able to give effective answers to clients, the ability to innovate and adapt to change can determine business success. The Project Manager is a fundamental part of this because his/her role is to detect and translate the clients needs into concrete projects that offer advantages that lead to a competitive edge over the competition.

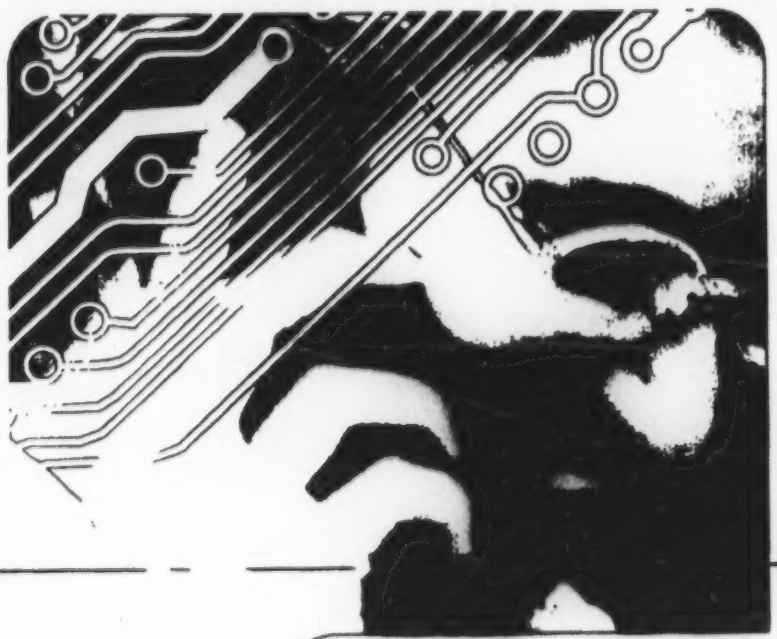
The Role

The Project Manager has a fundamental role in the design, development and results of his/her projects. His/her function is as much creative as that of an integrator. The project manager offers client solutions therefore she/he offers creativity as an answer to the clients' needs. To solve the clients' demands he forms a group of specialists, which she/he directs, and co-ordinates as well as integrating her/his ideas into a definite solution.

The Lifestyle

The competitive environment that we move in means there are a many business demands that are handled by means of projects. The characteristics and size of these projects mean that often the teams are made up of a great variety of people from different areas, with different languages and varied professional backgrounds. The Project Manager has to co-ordinate and direct these diverse groups, which means he/she needs great flexibility and an open mind. Linked to initiative, energy, and the ability to empathise with members of the team so as to take full advantage of their potential and integrate all their possible contributions into the projects.

EXAMPLES OF JOB TITLES



gement

TASKS ASSOCIATED WITH THE JOB

- Organise, time and resources available in order to comply with time frames and quality standards.
- Co-ordinate and prioritise activities and establish critical points in the design and development of the projects to obtain excellent results.
- Direct and manage projects.
- Implement on going assessment and evaluation models for the projects he/she directs or is involved in, trouble shooting and implementing the necessary improvements to guarantee successful results.
- Apply consulting methods adapted to the circumstances in which the projects develop.
- Analyse client needs, means and the timeframes, that are available and the conditioners that could exist in order to offer the most beneficial solution for the client.
- Establish open and fluid communication between all members involved in the project and at any given time have available the order, guidelines, specifications and information necessary for the development of the project.
- Ensure the team members meet the deadlines as well as well managing the budget assigned to the project in order to reach the desired results.
- Build and obtain product –market- share by working with sales colleagues to develop product and sales strategies as well as being the links between the customers and company multidisciplinary teams
- Determine product positioning

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- Because of the role carried out by the Project Manager, he/she has an important role in each and every business area including the technology areas

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Negotiation
- Leadership
- Client / Customer Orientation
- Initiative
- Flexibility

Technical Skills

- Project Management
- Business Acumen
- Planning and Organisation

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

The career path of a project manager normally starts off in any of the jobs defined in the profiles. As she/he gains experience she/he will participate in more important multidisciplinary projects, that cover diverse topics and in due course he/she will progress to more senior levels. As she/he gains more responsibility and experience she/he will move onto a project leader status.

THE TYPE OF PERSON THIS JOB WOULD SUIT

Somebody who prefers to combine technical knowledge with business knowledge and has the ability to drive a team towards a specific goal would like this job. A person who would enjoy being the link between customers and his/her own company would be good at the job. A person who likes analysing the market and negotiating would enjoy the job.

A technical degree (first cycle degree), or a business degree with a large technical component would be the normal entry requirement into the industry; an individual could then eventually grow into this type of job.

People with Project Management experience in other industries often bring their project management skills to the industry; they often receive training in some technical aspects of the industry.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Intel, Microsoft, Nokia, Nortel Networks, Philips Semiconductors, Siemens A.G., Telefónica S.A., Thales.

Vanessa F
B.Sc (Hons) Computer Science
University College Dublin
Intel

Upon graduating from University College Dublin with an honours degree in Computer Science, I began my career in the semiconductor industry with Hyundai Electronic Industries, based in South Korea. Upon completion of my contract, I successfully applied for a position with Intel and relocated back to Ireland in 1997.

Intel is a high paced and dynamic environment, with a strong focus on results and emphasis on continuous improvement. I presently work in a software application development group focusing on web-based decision support solutions for Intel Manufacturing Facilities worldwide. These facilities are 24x7, hence the primary success criteria for developed applications is data integrity (information displayed is accurate) and data availability (information is available when required 24x7).

The primary role of the project manager is to ensure that a high quality project is delivered on time and within budget which meets the customers expectations. In my group, we use a structured Software-Level Project Lifecycle to ensure that quality is engrained in our applications from project definition. Within industry, software projects are infamous for missing schedule dates and / or not delivering the expected requirements. The use of a structured life cycle process ensures a higher probability of meeting committed schedule release dates, with an application that is robust and that meets the customers expectations.

The key tasks for a project manager within any project is to Plan, Control & Communicate:

Plan:	ensure that all phases of the project lifecycle are captured, sufficient skilled resources are in place, project risks are captured.
Control:	tracking the project progress to ensure that it is on track to meet the scheduled release date.
Communicate:	ensure effective communication within the development team, with customers and with management.

The key skills required for a project manager are: strong interpersonal and communication skills (written, verbal & listening); problem solving; conflict resolution; leadership; and administrative skills. A project manager must have the ability to motivate the team to ensure timely project execution and if necessary, insulate the team from unnecessary intrusions.

A strong technical background is required in order to understand the project and to assist in resolving roadblocks from the schedule. A project manager does not need to know the answer to every question but they do need to know where to get questions answered.

On a day to day basis, I would interact with customers, developers, Quality Control (QC) and management. The interactions usually occur locally in project meetings or informal discussions but in some cases, the target customer/user base for a specific application may be worldwide, therefore communication may occur via e-mail, phone and on-line. During the various phases of the project, I would be involved in requirements gathering and validation, analysis & design overview, ensuring that developers are on schedule for code completion, that technical issues/roadblocks are understood and being resolved, ensuring that the application is integrated prior to delivery to the QC group for testing, reviewing defect/bug reports from the QC group to ensure that owners are assigned and that each issue is closed out. At any stage during a project, there may be requested changes to the project. This scope creep needs to be tightly managed as it may impact schedule delivery date.

The continuous advancement in technology poses further exciting challenges for application development. Within the group that I work in, one specific area of investigation and prototyping is that of next generation technologies, like wireless handheld devices. This direction presents further challenges to project managers - to effectively manage the risks that new technologies pose yet balance the need that customers and users have - the need for accessibility to quality data, faster.

BROAD JOB AREA

Research and Tec

JOB DESCRIPTION

The Vision

The future of the ICT industry relies upon Technical Experts that define the future technologies of the industry. These people may have had a long career in the company or come from an academic background having shown outstanding excellence in research and development. One of their jobs is to imagine and suggest innovative products from their deep knowledge of emerging and new technologies.

The Role

The Technical (or Technology) Expert advises, influences and guides a community in specific research or technology areas and provides technical leadership to internal and external groups. The Technical (or Technology) Expert is innovative and active in contributing ideas, solving problems and defining project content. She/he participates in, and contributes to, reviews and audits of tasks/projects/programmes and influences the development of his/her technology area e.g. by working with standardisation bodies. The Technical (or Technology) Expert translates current & future customer/ end user expectations to products, solutions and facilitates competence development, knowledge sharing, and coaching, and mentoring within her/his technology area.

The Technology (Technical) Expert may also guide and instruct others and share her/his own expertise for the good of the project. She/he participates in the creation of technology strategies and participates in, and contributes to, reviews and audits of programmes. She/he contributes to decisions on technology options and participates in internal and external scientific forums. The Technology (Technical) Expert facilitates competence development, knowledge sharing and coaching & mentoring within his/ her technology area.

EXAMPLES OF JOB TITLES

hnology Development

The Lifestyle

Technology policy development requires the input from internal and external sources and is usually done on an international and multi-site level. The Technology Expert plays an active role in advising, influencing, and guiding a community in specific research or technology area and provides technical leadership to internal and external groups. Meetings are held on a regular basis and the job requires extensive national and international travel both within the company and to external conferences etc.

TASKS ASSOCIATED WITH THE JOB

- At the zenith of her/his career the Technology (technical) Expert may be a company's global authority and a final reference point within the company for technical input. She/he may work as an internal consultant and is often responsible for advising other senior technical experts within the same discipline. The Technology (technical) Expert actively seeks new opportunities and contributes key ideas to projects and programs and has a thorough understanding of the company processes. She/he contributes to the company's different management boards and maintains a broad view of emerging technologies. The Technology (technical) Expert is therefore required to master several areas of technology or have a very deep understanding in one particular technology area. She/he frequently contributes to the creation of the company's technology vision & overall strategy.

- The Research Engineer/Scientist is often free to select her/his working methods and work independently on projects. She /he may choose to work mainly in a laboratory or in a company's research and development unit. The Research Engineer/Scientist is able to handle external relations according to an agreed strategy and plans to be innovative and active in problem solving especially in research problems. She /he can often be a project manager on small projects.

- The Senior Research Engineer/Scientist has an ability to act as a specialist or project manager in certain technology area projects. She/he is able to handle external relations independently and is innovative and active in contributing ideas, solving problems and defining project content.

- The Principal Scientist is one of the company's technology leaders, a member of the company's advisory forums. She/he is active in seeking new opportunities, contributes key ideas to projects and promotes his/her technology area and project results. The Principal Scientist has an information sharing and coaching attitude to enhance knowledge transfer.

- The Research Fellow is a member of the internal and external international technology community. She/he is actively networking and invited and consulted by technology communities. The Research Fellow actively promotes new ideas in large international programs.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- All ICT technology areas are associated with this job.

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Analytical & Conceptual Thinking
- Applying Knowledge
- Communication
- Creative
- Open to New Ideas
- Self Development
- Professional Attitude
- Decision Making
- Initiative
- Mentoring & Supporting Others
- Problem Solving Techniques
- Learning Processes & Methods

Technical Skills

- Understanding of Technologies
- English and Other Languages
- Networking Concepts
- Quality Assurance
- Technology Trends
- Time Management
- Team-Work
- Creative in relation to Technology
- Flexibility & Self Learning
- Technical Orientation & Interest
- Strategy & Planning
- Technology Trends (technical)

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

Often a career as a Research Engineer/Scientist starts in one specialist field. After about five years experience and having built up an internal and external network, a person would normally progress to a Senior Research Engineer or Senior Scientist role. With continuous enlarging of her/his area of technical expertise and building internal and external scientific networks the career development would lead to jobs such as Principal Scientist and later to Research Fellow. Principal Scientists typically have a minimum of ten years experience or the equivalent knowledge, while Research Fellowships are more a reward or recognition of an individuals expertise and accomplishments over a period of ten years or so.

A person in this type of role may choose to remain in a fundamentally technical scientific job for their whole career. The career path for these people also has the potential to reach the highest levels of management. These people may have a long career in the company demonstrating outstanding excellence in research and development throughout their working life.

THE TYPE OF PERSON THIS JOB WOULD SUIT

A strategic thinker with a deep knowledge of science and technology with excellent communication and networking skills would enjoy this job. This is a job for people with a Ph. D. (Doctorate) in ICT technology and with an academic research or people with a very strong background of achievement in industry background. This is a rather high level job for which head hunters would likely recruit on a global basis or for which a person would 'grow' within a company gaining years of experience and staying continuously abreast or ahead of the latest technological developments or new possibilities emerging from world wide research.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Intel, Microsoft, Nokia, Nortel Networks, Philips Semiconductors, Siemens A.G., Telefónica S.A., Thales.

Chi Z Zhu
Ph.D. (Loughborough University of Technology, United Kingdom) Digital Communications
Nokia

I came from Beijing, China to start my undergraduate studies at Loughborough University of Technology, the UK, in 1979. I received my BSc degree in Electronics, Computing and Systems Engineering in 1983 and decided to stay on for a PhD in Digital Communications which I received in 1986.

I then started a job at a British Government Research Lab. near Oxford and did research for the government and university cooperation projects. In 1991 I was employed by Nokia Mobile Phones as a Digital Communications Specialist., where I worked on GSM phone design, algorithm design, and leading a small team of R & D engineers. Later I worked on the design of PDC phones for the Japanese market.

In 1993, I moved to Finland and started at the Nokia Research Center as a Senior Research Engineer. We did the research and development for new GSM features such as High Speed Circuit Switched Data Services and the early work of GPRS, basically focusing on system development. I was later on promoted to Principal Scientist. In 1995, I moved to Nokia office in Dallas, Texas, USA, to work on the development of new features for IS-95 system, including packet data services and related standardization work. In 1998, I came back to Finland and I have been continuing my work as a Principal Scientist, working on Mobile and IP Network solution development.

The reason why I chose to go into this field is that I had always been interested more in mathematics and telecommunications theory has a lot of mathematics in it. I like to work in this industry because I enjoy those tasks, which require a lot of logical thinking and system wide knowledge. The technologies are developing extremely fast. I have always had trouble to focus on just one thing and this kind of R & D work with fast content change suits me reasonably well. I believe this industry will still change with a similar kind of fast pace for at least another 10-15 years. Another advantage of working in the technical field is that I do not have to manage a large group of personnel. Of course a lot of our work is done with teams, but staying in a technical role has enabled me to progress in my career without having to manage a large group of subordinates.

BROAD JOB AREA

ICT Management

JOB DESCRIPTION

The Vision

Within any effective Information Communications Technology organisation there will need to be people who possess strong management capabilities. Management roles exist in all functions, (finance, sales, administration etc.) within a company. All management jobs comprise three roles:

Lead Leading others by setting direction, motivation and achieving goals.

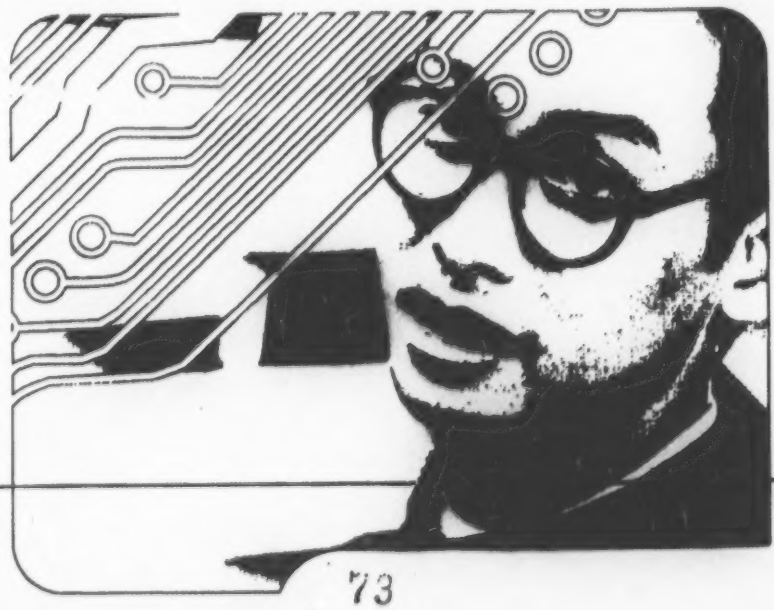
Manage Manage processes, resources, finance, time, property and people.

Do Many managers are also practitioners needing to be competent in the tasks for which their department is responsible. The more senior the manager the higher the percentage of leadership and the lower the percentage of 'doing'.

ICT Managers are responsible for and measured on their ability to deliver business results. The results are expressed in terms of customer satisfaction, products sold, services rendered and profit made. Since management roles have a 'Do" content the roles vary from function to function. The rest of this profile concentrates on management roles in technical environments, whether it is managing technology issues, sales issues or business issues an appreciation of the technology and products being sold will be required.

EXAMPLES OF JOB TITLES

Usually people who perform a role which is predominantly management will in the past have undertaken technical roles which may have led them into team and project leadership, where management responsibilities will start. This would be an unlikely path for people who enjoy possessing and developing in-depth technical understanding as knowledge will need to broaden with experience and seniority as strategic direction setting becomes an increasingly essential part of the role. A management role can take an individual to the very top of an organisation for example to Chief Executive or Managing Director.



The Role

Line managers, although likely to have sound technical knowledge in their particular field, specialise in the management of teams of people. Their role is to lead and motivate these people, which will include technical, or sales or marketing specialists of differing levels of experience, ensuring that they are aligned and committed to the organisation's objectives.

The manager creates the pre-conditions for the team members to reach their targets through generating ownership and commitment, building strong morale, mentoring and encouraging an open working environment.

They also need to ensure that their people have the tools, skills, resources, processes and rewards to enable and encourage them to do their job. So for example managers will recruit new people, co-ordinated resources- assigning tasks to people, enable their specialists to develop technical and personal skills, and assist their people in career planning.

Managers of sales specialists will normally have demonstrated expertise in the role of selling and will set sales targets for their salesmen and women and assess achievement against those targets. Managers of technical specialists will have demonstrated competence in a technology area and will be able to break down large complex tasks such as design a widget, support a system or write a programme into tasks for specific specialists in their domain.

Often the manager can be seen as an ambassador for his/her department ensuring the value and capabilities of the department are well understood and appreciated both within the company and by customers. Equally often however the manager will have to accept broader company wide objectives which may mean she/he will need to change his/her department's role or reduce the number of people, or change the benefits that the department personnel is used to receiving. Periods of downsizing can be challenging times for a manger.

The Lifestyle

An ICT Manager spends a substantial amount of time meeting with teams, key customers and suppliers, nurturing relationships. An ICT Manager is continuously developing his/her knowledge of the ever changing business environment and aligning the business with that, setting the strategic direction of the organisation. Effective communication and negotiation skills are a vital asset as is the ability to take important decisions. Many management roles, like many project management roles require the production and presentation of reports- progress reports, status reports, and feasibility studies for example. Successful managers spent time networking with other key people within and outside their organisation in order to be able to anticipate change and respond to them before or as they occur. Often senior managers will need information and to take action quickly and this will require working some long days and nights to deliver what is required when it is needed. Enjoying life as an ICT manager depends on the ability to anticipate change and plan for it so that when it happens it can be handled with minimum stress.

TASKS ASSOCIATED WITH THE JOB

- Acquisition, assessment, training/ coaching and promotion of employees
- Tracks performance of team members, executes performance appraisal and sets goals
- Allocates new resources (human and other)
- Maintenance of current projects, following new and emerging projects and technologies
- Ensures performance improvement
- Defines requirements for development environment
- Responsible for cost centre
- Responsible for information exchange with more senior management
- Represents his/her own team or function vis-à-vis more senior management

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- All technology areas which relate to the different ICT technologies are associated with the job.

TYPE AND LEVEL OF SKILLS

Behavioural Skills

- Relationships
- Leadership
- Communication
- Strategy & Planning
- Decision Making
- Stress Resistant

Technical Skills

- Knowledge of the Management of Change
- Business Knowledge

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

ICT Managers can reach the highest roles in the company such as chief executive or chairman. ICT managers often become entrepreneurs and start up their own companies. Over a long career ICT Managers would, as they gained experience, be made responsible for bigger budgets and programmes and a larger number of people.

THE TYPE OF PERSON THIS JOB WOULD SUIT

This is a job for someone who likes people, is a good communicator, and is able to lead people and get the their best work out of them. A strategic thinker would be good in this job.

A business first cycle degree in accountancy, management, commerce would be a normal entry level qualification for this type of job. Demonstrated experience would also be a useful asset. A master in Business or an MBA (Masters of Business Administration) would also be useful qualifications for this job. People with a technical or Engineering degrees might with business experience and postgraduate business qualifications grow into an ICT Managers job.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Intel, Microsoft, Nokia, Nortel Networks, Philips Semiconductors, Siemens A.G., Telefónica S.A., Thales.

Stewart Davies
Chief Executive Officer BTexact Technologies - BT
B.Sc in Electronic & Electrical Engineering
Chartered Engineer & Fellow of the IEE

Despite what people may say there are few people who successfully plan their career. The career opportunities you are presented with will usually result from your track record, being in the right place at the right time and an element of luck.

At school I was reasonable at most subjects but enjoyed the sciences most. I used to look forward to my physics and electronics classes and this was the beginning of my career in engineering.

I joined BT, in the North West, as an apprentice in 1968. I won a BT scholarship which enabled me to attend the University of Manchester. At the end of the first term at University I managed to fail my Christmas exams (spending too much time concentrating on pop music and playing in a band, I think). However, I recovered from that, worked hard and graduated with a 1st class honours degree in Electronic and Electrical Engineering. You see, failing is almost as important as winning because of what it teaches you and how it enables you to learn. It is OK to fail as long as you learn from it. It also teaches you to look ahead and try and predict the outcome of events from the decisions you take.

After graduation I was asked to join the research department at BT Research Laboratories. My original desire was to working internationally but I was persuaded otherwise due to the changes taking place in the technology world at that time and the opportunities which that presented me with. I spent 8 years in research working on digital switching, System X development and PABX hardware and software design prior to leaving this part of BT in 1982.

From 1982 to 1991 I undertook various assignments where I had product management responsibility, then moved into International Products Division (IPD) with business management responsibility for the Government Sector and commercial business. This was my first real commercial and business management role and the experience I gained during this time has been invaluable to me throughout my career.

I rejoined the BT Research Laboratories in 1991, when I became General Manager for Applied Systems and Operations, from BT Syntegra (then BT Customer Systems) This gave me the opportunity to re-learn about the then current network technology and to be a part of developing the new services and systems for communications of the future, working with the Internet when it was a little known quantity.

In 1994 I was appointed Department Manager, Systems Integration, where I had responsibility for BT systems integration of networks, transmission systems and network and customer service. The role also brought line management responsibility for 800 people. In 1996 I became General Manager, Systems Engineering Operations with responsibility for Systems Engineering Delivery across the whole of the BT Group. In 1997 I was appointed Director, Network Platform Design and Management, responsible for network strategy, architecture and design for the UK network, a very challenging role in a time of rapid change and one which enabled me to participate in the changes form narrowband switching to very large scale internet protocol networks.

In March 1999 I was appointed Director of Advanced Communications Engineering and became Managing Director of BTexaCT in September 2000. The unit of over 3000 people is based at Adastral Park in Suffolk and is responsible for the development and delivery of advanced technology into the BT business. This includes multimedia, internet protocols and data networks, mobile solutions, advanced research, network management solutions, systems integration and design solutions for BT's interests in the global arena including joint ventures. I was appointed Chief Executive Officer of BTexact Technologies in April 2001 when our remit to offer our services outside the BT group was established.

My aim has never been to just be the head of an organisation. I have come from a working class background which gave me the desire to succeed and I have always tried to create self sustaining and long term business futures for the organisations I have worked with. Communications has a vital part to play in success and I have always tried to ensure that even when faced with complex opportunities, the message to everyone is the same, clear and not diluted.

The key, to what was to become a successful career for me, was simply to play to my strengths. To do the things that I enjoyed most and to do them as well as I could. I have been fortunate enough to have had (and still have) several excellent mentors during my career, people who I have admired and been able to learn from. My philosophy has always been to treat each job as an assignment and not as a route to anything else. I have concentrated on achieving what the assignment demanded, to share my customer's vision and to ensure that, by the time we have finished, all involved have been significantly enhanced by the experience, to feel proud to have worked together and hopefully achieve great results.

BROAD JOB AREA

ICT Sales Manag

JOB DESCRIPTION

The Vision

Regardless of how wonderful a company's products are, if no one knows about them, it is not going to be a successful business. Marketing (see separate profile), creates awareness for a company's products. This works fine where the product is straight forward or well understood, the potential customer, now that she/he is aware of your product makes contact with the producer and asks for explanations on the benefits of the company's product, compared to similar products from other suppliers that are on the market and that he may be considering buying. This is typically the way expensive complex consumer products such as cars, home entertainment systems and home PCs are bought.

Many products in the ICT industry are highly complex, incredibly configurable and often it is not immediately obvious to see how they would be used. This is where the Salesperson and Account Manager come in. By being both knowledgeable about the product and about their customers businesses they are able to explain to the customer how the product could be used in the clients business and what the business benefit would be to the client. The business benefit might be expressed or described in terms of increased revenue, reduced costs or opening up new markets.

In relation to other business areas, the ICT sector has grown exponentially due to the explosion of information technology, which has created a highly competitive environment the dynamism of which is maintained by the continual entry of new competitors. In order to maintain a competitive position the attraction, capture and maintenance of the continued loyalty of clients has moved to the forefront of most company's commercial strategies.

EXAMPLES OF JOB TITLES

The Role

A salesman or sales-woman would typically be responsible for a territory, or a set of customers. This could be geographically based – e.g. all customers in part of a country, or industry based – e.g. all customers that manufacture cars. Depending on the product and the territory the Salesperson may have just a few customers or many hundreds of potential customers. In this latter case one of the key skills the Sales Manager must have, is to be able determine which customers she/he should spend time on, in order to maximise the revenue that can be generated for the company.

For larger customers the salesman will often call on his customers to understand their needs, explain the benefits of his products and to negotiate a commercial agreement that is good for the customer and the supplier. For smaller customers much of this work will probably be done on the phone or by email.

The Key Account Manager's role is very similar except she/he only has one or a very few customers (accounts) to look after. This enables her/him to get to know the customer's business very well and to be able to tailor and customise her/his companies solutions to best meet her/his customers requirements She/he will often be bringing in experts and consultants from his or other companies to provide guidance to his customer in setting a strategy, or in selecting the best products or in implementing the solutions by means of her/his products.

Assuming that the client or customer is the key of any business and fundamental in the companies value chain we can understand the importance of the Key Account Manager's job (KAM). He/she is the link between the client and the company, his/her function is to anticipate and know the clients needs and offer them solutions in the form of Information technology and telecommunications products and services that respond to the client's needs.

The Lifestyle

The Salesperson and Key Account Managers job means she/he spends most of her/his time listening and talking to customers, either on the phone or in person. Some roles are exclusively telephone based, some exclusively customer site based, most are a mixture of the two. For those roles involving meeting customers there is often a lot of travel, as well as a lot of corporate entertaining as the salesperson seeks to better understand his customers needs and build a relationship where both parties can trust each other.

Often the Sales Manager or Key Account Manager will bring his customer to visit the company's development laboratories or manufacturing plant so that her/his customer can understand future product developments and be assured of top quality products. Often these laboratories and manufacturing plants will be overseas, so the visit will involve foreign travel for the sales manager and his customer.

The dynamics of the sector have created a highly competitive environment in favour of the customers. This means that the ICT Sales Manager has to have an in-depth knowledge of the market, the structure and organisation of the clients business and of the technological solutions available so as to be able to offer the best solution to the demands that arrive at her/his door.

TASKS ASSOCIATED WITH THE JOB

- A good understanding of the customers business and what is important in the business, e.g. price, delivery times, speed to market, dependability
- Knowledge of the organisation and activity of the clients so she can anticipate their needs with technical solutions that offer an efficient response to them.
- Define and prepare Sales proposals.
- Optimise results from on going assessment with the objective of creating client loyalty and guaranteeing future sales.
- Market analysis and analysis of competitors situation.
- Analysis of the clients profitability so as to implement appropriate sales actions.

TECHNOLOGY AREAS ASSOCIATED WITH THE JOB

- With reference to the technological solutions, the related areas will be those related to the telecommunications products and services

TYPE AND LEVEL OF SKILLS

The training and development of a key account manager should cover abilities like business acumen, client orientation, negotiation, communication skills as well as business aspects like marketing strategy, 'the marketing mix' ICT sector aspects and ICT technology trends.

Behavioural Skills

- Negotiating
- Customer Orientation
- Initiative
- Emotional Control
- Communication
- Persuasiveness

Technical Skills

- Technology Trends
- Technical Documentation
- Product Knowledge relevant for the Industry
  e.g. Telecommunications, Business Application Software, Computer Servers, Networks, Storage Devices...
- Business Vision (Business Acumen)

DESCRIPTION OF CAREER PATH / FUTURE OPPORTUNITIES

The career path of a Sales Manager might start in a technical area where she/he could consolidate her/his technical knowledge as preparation for the next stage of her/his development in the commercial area. Once in the commercial area she/he will acquire the relevant experience depending on her/his initial profile.

There is a strong link between the ICT Sales Manager career profile and the ICT Marketing Manager's one since the two areas are interconnected. The Sales Manager is an important source of information for the Marketing Manager on the products and services to be sold and the segments of customers which are the critical markets for those products or and services.

As the Sales Manager's career develops and she/he gains experience of the ICT industry and begins to meet targets and get the expected results, she/he will be given more authority and gradually move on to more important client portfolios. The Sales Manager's career path could take her/him on to a more general management role, or a training manager role and might involve developing new key accounts.

THE TYPE OF PERSON THIS JOB WOULD SUIT

This is a job for a 'people' person who likes technology. This nature of the job means that the ICT Sales Manager has to be a dynamic person with wide ranging knowledge of the business and the business world. He /she must be pro-active so as to can anticipate the clients needs, with a gift for communication and negotiation. A solid technical training that has given her/him the necessary knowledge to carry out this job to a very high standard is needed as a base.

A first cycle degree in business studies with an emphasis on sales would be required for entry to this job area. In addition to that a degree with a high technical background and a focus on Information Communication Telecommunications technologies e.g. computer science, degree in telecommunication would be a good base for this job.

JOBS OF THIS TYPE ARE TYPICAL IN

BT, Cisco Systems, IBM, Intel, Microsoft, Nokia, Nortel Networks, Philips Semiconductors, Siemens A.G., Telefónica S.A., Thales.

Mar I
Graduated in Engineering
at Universidad Politécnica in Madrid
Telefónica S.A.

fter graduating in engineering, I took several graduated courses in areas such as quality management, consulting, organization and logistics.

I am an outgoing and sociable person. This is why I decided to focus my professional career to sales area. I started working as a sales manager in a spanish company where I developed key skills to work in today's environment such as listening, flexibility, negotiation, decision making and adaptation.

I started working for Telefónica two years ago as a sales manager. I'm in charge of 130 customers, most of them medium size companies. My duties are to detect and provide Telefónica's customers the best solutions to their telecomunications needs as well as to motivate them to use the new technologies in their strategies and procedures.

Besides advising my customers I take part in the coordination and integration of the different departments that belong to the sales area in order to take the actions to achieve the targets of the company.

I get very motivated because I have to learn new things constantly in order to face and solve different problems that show up in everyday situations.

The sales area is a very dynamic one where daily work is going at a high rate. This is why for a sales manager keeping this high rate is an everyday challenge and a element of motivation to develop the skills required to be a good professional in the sales environment.

Recently I entered the sales career in Telefónica as a key account sales manager. The sales career has been designed and developed to reward, train and motivate the sales force that is considered a key element in today's strategy.

Definitions/Jargon Buster

LIST OF BEHAVIOURAL SKILLS AND DEFINITIONS

Analytical - Able to acquire information and identify missing information. Able to look logically at a technical situation to solve problems and create new and innovative solutions. Prepared to use facts, data, measurements and a logical process to carry out a job. Often tools and methodologies will exist to assist with this analytical work and a high degree of proficiency would be expected in the use of these.

Attention to Detail - Able to produce accurate work, even when under pressure. For critical information it is important to check the accuracy of information before using it or passing on to others.

Commercial Awareness - Ability to apply knowledge of the impact of the market, political environment, legal, regulatory and financial constraints to decision making.

Commitment to Excellence - Has a passion for succeeding in assigned tasks and to produce work of the highest quality. Will adjust working time to meet the demands of the business. Meets own commitments and ensures the completion of own tasks. Is responsible and can be relied upon.

Communication - Able to communicate effectively face-to-face, on the phone, in writing and via presentations. Knows when to abstract complex technical concepts and describe in terms meaningful and relevant to technical and business managers and to other non-technical people. Also knows how to obtain the maximum understanding from other people. Is able to build a network of contacts who can provide information and assistance.

Creative - The ability to create images and visions to help explain concepts and put ideas across in exciting and thought provoking ways.

Customer Orientation - Is focused on what is best for the customer, always lets customer needs, consistent with business profitability, drive actions and decisions.

Decision Making - The ability to make timely decisions based on adequate but often-incomplete information.

Flexibility and Self Learning - The ICT industry today is one of the fastest changing industries of all time. This makes it both an exhilarating and demanding environment in which to work. Products that everyone was using two years ago are replaced with alternative products. Ways of working that are common today will disappear tomorrow. To survive, and enjoy the experience, you will have a flexible attitude, be willing to acquire and learn new skills, new knowledge and new ways of working. Sometimes this will be achieved by formal education and sometimes by private study and research.

Information Handling - With email, the World Wide Web and company Internets the volume of information available significantly exceeds anyone persons capability to absorb it. Information handling skills are therefore needed to identify what is important and what is urgent and to be able to categorize information for easy retrieval.

Innovative - Ability of have new ideas, imagine practical solutions to problems.

Initiative - Able to recognize when action is required, will take control of the situation and implement or propose a course of action. Does not wait to be prompted.

Leadership
At the personal level capable of making decisions and recognising and managing conflict situations. Able to command the support of a team and carry out their decisions to completion. Willing to challenge existing processes and proposals. Able to create and sell a vision of the future which others are keen to follow.

Managing Risk - Considers the possible consequences of action or inaction and puts contingency plans in place to minimize negative consequences. Ensures appropriate levels of management are aware of major areas of risk.

Mentor - Mentor is derived from the Greek, meaning 'adviser', and is now used to describe someone who becomes a trusted guide or counselor to another person. Very often this is in a work setting where a colleague or peer supports and guides new or younger entrants to a company. It is also an important role of managers at all levels who are expected to guide and counsel the people for whom they are responsible. Increasingly mentors are also to be found in educational settings particularly where relationships have been forged between a school and a company and where its employees 'mentor' pupils who have special interests in science, engineering or ICT for example. Mentoring is a complex, learned skill and requires much of people engaged in it.

Negotiation - Can communicate with others to come up with a course of action, which meets the needs, and objectives of all parties. Not concerned with 'winning' an argument for its own sake but producing a solution, which meets the needs of the situation and the individuals, involved.

Persuasiveness - Able to convince others of the effectiveness of the proposals presented in a friendly and constructive way. Demonstrates other necessary attributes simultaneously (e.g. teamwork).

Planning and Organisation - When given a task, is able to determine and document, the best approach and the time required to carry it out. Approaches the task in an organised and professional way and highlights revisions to the plan in timely manner, based on the work already done and new factors. Ensures that the work is carried out in a way that conforms to the rules of the organisation. Delivers on time and works equally effectively on multiple tasks when necessary.

Problem Solving - We are all faced with problems every day. Problem Solving in this context relates specifically to technology or process related problems and is not just the ability to analyse the cause of the problem, design an appropriate workable solution and implement the solution but also to be able to anticipate potential problems and prevent them form occurring. To be skill-full in this area you will be proficient in gathering relevant information but also in assessing the quality and accuracy of the information.

Professional Attitude - Approaches tasks and colleagues in a responsible and professional manner demonstrating attributes, which are considered appropriate to the situation and job. Understands what is required in this respect and is able to modify attitudes to meet varying situations. Can be relied upon to produce quality results efficiently that bring credit to themselves, their team and their company. Takes ownership and responsibility for work items and is tenacious in work through or round problems. Works efficiently and effectively to produce a quality result.

Relationships - Every job in the Information Technology and Telecommunications industry requires an ability to work effectively with our people. In general the more senior the position the more the need to work with a wider range and type of person. For some job roles junior roles only require effectively relationships with a small team of colleagues, e.g. some Product Design roles. In other roles such as IT Business Consultancy the ability to form relationships quickly and easily with a wide range of customer people including managers, financial analysts, personnel specialists as well as technical practitioners If "Relationships" is identified as a core expertise for the role then you will be expected to be able to establish effective business relationships with team members, customers and other colleagues. You will have good communication skills, be able to listen effectively to others and be confident in seeking advice when appropriate. You will quickly develop a network of contacts and be ready to share information and ideas.

Strategy and Planning - Able to take a broad and long-term view of what needs to be done in a particular situation and translate it into detailed actions.

Teamwork - Demonstrates a strong desire to see the team achieve its agreed goals. Prepared to support team members and team decisions at expense of own goals. Recognises the value of having diverse attitude, skills, experiences and views and prepared to ensure they are harnessed when appropriate.

Technical Orientation and Interest - Is excited by finding out how things work. Applies technical understanding to solve business problems. Willing and excited by performing technical and analytical tasks in the IT and telecommunications areas.

LIST OF TECHNICAL SKILLS AND DEFINITIONS

A/D - A/D Analogue/Digital: Information can be exchanged either in a digital format or in analogue format. Typical analogue sources of information are our voices, radio waves, and films. More and more information is being handled digitally, for example mobile phones have moved from analogue to digital and radio and TV broadcasts will become digital in the future. The reason for this is two fold. You can transmit more information in the same space if you use a digital form rather than an analogue, and you can ensure the quality of the information is exactly the same when received as when transmitted. So for example you don't get any crackles, pops or hisses when listening to a CD (digital) when compared to a vinyl record (analogue). Since we receive information in an analogue form (sound sight etc) there is a need to provide converters between analogue and digital forms of the information.

Applications Design Concepts - Understand how applications use the services of operating systems and concepts such as processors, working storage, message passing, and transactions processing.

Artistic Knowledge - The ability of modern computers to handle multimedia, i.e. audio, voice, still images, moving images and video has created a new range of opportunities for people who understand the effect of colour and tone and other artistic elements on peoples behaviour. A strong artistic capability and sound understanding of artistic principles will enable you to create designs that will bring knowledge and processes to life for a business's customers.

ASIC - ASIC -Application Specific Integrated Circuit is similar to FPGA but fixed metal masks do the interconnection. Still speedy but not that flexible, normally used in stable development phases and for mass production.

Business Awareness or Business Acumen - Business awareness or business acumen is about having a knowledge and cognisance of business and an insight into the importance of 'the bottom line' when it comes to the success (or otherwise) of a company. It is the ability of an employee to recognise the importance of their role and the contribution it makes to business success and always keeps this awareness at the forefront of their endeavors. Employers increasingly look for such awareness in potential recruits.

B2B - B2B business to business refers to the optimal use by business of the Internet and Digital technologies.

Business Requirements Analysis - For most businesses IT is not the core function, it is a means to an end. Business managers know what they want to achieve. IT specialists know what can be done with computer and telecommunication systems. The person that can translate these business processes and requirements into an IT specification that enables IT systems to be developed to meet these business needs is the essential missing link in the process. This is a difficult skill to acquire, as it requires a good understanding of the major business processes such as order processing or customer relationship management, as well as an understanding of how companies are organised combined with an appreciation of what IT can and cannot do. Frequently there are trade-offs between what can be produced in the time scale and budget required and what the customer would ideally like. Excellent communication skills are required to ensure effective understanding between the technical experts and the business managers.

Business Strategy Planning - Understand, build or modify the strategy of a business to reflect its overall goals. Assess a strategy and understand the implications in terms of required solutions using technology and/or business process changes.

Computer Programming - An understanding of programming makes almost every a job in the ICT industry either easier to do, or easier to be successful in. For many Software Developers it is of course the core skill and comprises an understanding of the software development process including program design, coding and testing. Programming is a skill that is used and of great value in many jobs. Practical experience of writing programmes in languages such as C, C++, Fortran, ADA or Smalltalk will often be needed. It is useful to know both a procedural language as well as Object Orientated Analysis and Design methods. For software development opportunities relating to Internet enabled applications and the development of Web sites HTML, XML, Lingo and Java are popular languages. In addition to the language itself there will be a range of tools designed to speed up the development process such as visual design tools and debuggers and knowledge of these is useful. Examples in Multimedia development would be Frontpage, Visual tools or Illustrator.

Computing Systems Design - At the heart of all computer systems is a processor. A sound understanding of the functional components of the processor and how the processor interfaces to other system components such as memory, systems busses and disks is essential to many jobs in ICT. Whilst the functional characteristics of computer systems are not difficult to grasp the performance characteristics of these components (disks, memory etc) are often complex but are equally important to know in designing successful systems.

Cost Modelling - Where large numbers of different devices are required it can become quite complex working out the most cost-effective solution. By producing a financial model of the proposed solution it becomes possible to test alternative designs quickly and efficiently.

C.M.O.S. - C.M.O.S. (complementary metal-oxide semiconductor) is the semiconductor technology used in the transistors that are manufactured into most of today's computer microchips. Semiconductors are made of silicon and germanium, materials which "sort of" conduct electricity, but not enthusiastically. Areas of these materials that are "doped" by adding impurities become full-scale

conductors of either extra electrons with a negative charge (N-type transistors) or of positive charge carriers (P-type transistors). In CMOS technology, both kinds of transistors are used in a complementary way to form a current gate that forms an effective means of electrical control. CMOS transistors use almost no power when not needed. As the current direction changes more rapidly, however, the transistors become hot. This characteristic tends to limit the speed at which microprocessors can operate.

Database Concepts - Whenever large volumes of data need to be stored, or an ability to search or access part of the data is required, then a database will be used. Understanding database concepts means understanding the theory and practice of database systems, the different ways of storing and accessing large volumes of data, the different types of database management systems and the performance trade-offs in their selection and design. The ability to create a simple database and to be able to write queries and reports is a very useful skill.

Design Methods - Ability to use different processes to ensure that the product meets customer expectations at the lowest cost.

Digital Design Skills - Ability to design fast and complex digital circuits. As well as understanding design principles an understanding of Computer Aided Engineering (CAE) techniques that are used in circuit design and layout would be useful. Tools such as Caeds, Mentor and Catia.

Documentation - Able to organise documents and reports and to express complex technical subjects in an understandable manner.

DSP - DSP is an abbreviation for Digital Signal Processing.

E-commerce, e-business - The most successful e-commerce websites focus on more than just commerce and look at improving communication between business partners be they suppliers or customers. B2B -business to business or B2C -business to consumers. A good e-commerce solution –an extranet or an e-market place would provide content to its users as well as online ordering. An e-commerce strategy should be evaluated in terms of the value it brings to the relationship between buyers and sellers. E-commerce implies re-engineering of corporate structures such as purchasing, logistics, manufacturing, marketing, distribution and communication to achieve lower costs, faster time-to-market as well as improved product and service quality. All of the above lead to integrated e-business solutions.

Electronics Theory and Know-how (analogue/digital) - This is the core technical skill in any hardware design or development role. Understand electronics theory and apply it in design work. Knowledge of and ability to use different components in design. Ability to design electronic (analogue/digital) circuits. Basic understanding of signal processing. Since the purpose of hardware design is to lead to a manufactured device an ability to estimate the cost of the device and an understanding of the different stages of both design and manufacture is useful. Frequently, designs of electronic devices have to conform to standards, e.g. so an adapter will operate successfully in say a PC. This means the ability to read, understand and evaluate design specifications is a must.

Embedded Systems - Embedded systems are used when electronic systems use programmed microprocessor based technology The user probably does not know that they are interacting with the computer. Devices such as TVs, Cars and mobile phones make extensive use of embedded computers, controllers and software. Understand the particular requirements of embedded systems, - their control through software and knowledge about the particular techniques that are needed such as having to respond in real time to an event.

Encryption - Encryption is the process of protecting data (or information) by making it indecipherable to anyone other than those authorized to view it, particularly when it [data] is being transmitted or transported on a medium such as the internet, computer disks, tapes or CDs. Encrypted information cannot usually be decrypted or decoded without the use of a special 'data key' which forms an integral part of the code.

End User Interface - Understand the factors involved in building a successful human/machine interface. Bring to bear creative and technical skills to design and build multimedia systems using a variety of media (e.g. screen, touch, voice, and video…).

FPGA - FPGA -Field Programmable Gate Array, is a logic IC (integrated circuit) consisting of gates. The inter-connection between the gates determines the functionality of the IC. This inter-connection is programmable via SW and can be changed in a flexible way. FPGA's are normally used in early development phases for fast prototyping.

Firewalls - Firewalls are special devises (hardware or software), which lie between one computer or computer network and another and protect it from unauthorized access. A Firewall is designed to act as a gatekeeper between a personal computer or an intranet and the Internet. Firewalls can keep track of files entering (or leaving) a personal computer or intranet, detect viruses and their sources and any other problems which might attempt to enter or attack the system it is designed to protect.

Hardware Knowledge - Understanding of hardware systems and how they are constructed. Understanding the basic technologies of the hardware and also how the hardware functions. Understand the purpose of controllers or adapters and interface standards such as PCI used in PCs to allow peripheral devices such as disks drives to be connected. Understand the purpose of common computer peripherals such as disk and tapes and appreciate the significance of their different performance characteristics. Be able to match specifications to customer requirements. It is also useful to have a general understanding of the hardware development process, not in detail, but just to be able to appreciate issues such as time to market and engineering changes.

HTML - HTML -Hypertext Mark-up Language is the set of "mark-up" symbols or codes inserted in a file intended for display on a World Wide Web browser. The mark-up tells the Web browser how to display a Web page's words and images for the user. The individual mark-up codes are referred to as elements (but many people also refer to them as tags). It is a standard recommended by the World Wide Web Consortium (W3C) and adhered to by major browsers such as Microsoft's Internet Explorer and Netscape's Navigator.

HTTP - The Hypertext Transfer Protocol (HTTP) is the set of rules for exchanging files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web. Relative to the TCP/IP suite of protocols (which are the basis for information exchange on the Internet), HTTP is an application protocol. Essential concepts that are part of HTTP include (as its name implies) the idea that files can contain references to other files whose selection will elicit additional transfer requests. Any Web server contains, in addition to the HTML and other files it can serve, an HTTP program that is designed to wait for HTTP requests and handle them when they arrive. Web browsers are HTTP clients, sending requests to server machines. When the browser user enters file requests by either "opening" a Web file (typing in a Uniform Resource Locator or URL) or clicking on a hypertext link, the browser builds an HTTP request and sends it to the Internet Protocol address indicated by the URL. The HTTP program in the destination server machine receives the request and, after any necessary processing, the requested file is returned.

I.C. - Integrated Circuits.

Integration Concepts - Whoever you buy your music CD from you expect it to work in your hi-fi system, your car and your personal music system. When you use your mobile phone to make a call from another country you expect it to work. When you take money out of your bank by using a cash machine belonging to another bank you expect it to work.
These are consumer-orientated examples of systems integration in action. The common theme is that they involve technology from multiple manufactures having to conform to common specifications or standards. Specifications and standards are necessary to allow companies to co-operate . They can be industry wide, international, or just agreed for a specific development.
Where the fun and excitement starts is that everyone has their own interpretation of these specifications and if it is your job to show that the complete system works together you will need to know how to minimise these misunderstandings and how to resolve them effectively when they do occur.

I.P. - Internet Protocol.

LAN, WAN, MAN - Local, Wide and Metropolitan Area Network Increasingly to allow people to work together and share information and ideas our computers need to communicate and share data. In the world of communications the greater the distance the more it costs to transfer data at very high speeds. The larger the network of computers and other devices that need to share data the more challenging become the network management, security and addressing problems. Different technologies have evolved to solve these problems in different ways and to help the Computer and telecommunications industry understand which solutions are appropriate where the industry has given labels to the different types of communication networks. The network connection a collection of computing devices together in a single department or building is called a Local Area N*twork (LAN), If the network covers a University Campus or a town it is called Metropolitan and if it covers a whole country or many countries it is called a Wide Area Network.

Mathematics
Understand mathematical principals and appreciate the power and limitations of mathematics in solving computing and engineering problems. Able to accurately apply mathematical principles appropriate to computing such as methods of proof, logic and modelling methods. Be confident in applying mathematical formulae, performing arithmetic with large numbers and in manipulating large volumes of numbers.

MS - An abbreviation for Microsoft.

M-commerce - Mobile commerce see also e-commerce definition.

Networking Concepts and Architectures - Understand the functions of a network, the reason for and advantages of different networking protocols e.g. TCP/IP, FDDI, ATM, SDH. Understand the characteristics of different types of networks such as wireless, mobile, microwave, and satellite as well as LANs. Understand the reason for the different network layers and how addressing, routing, data integrity and performance requirements are achieved. Understand the need for and the use of Bridges, Routers, Hubs and Switches.

PCB - Printed Circuit Board - When the electronic industry started, individual electronic components would be connected together with wires. This was a time consuming manual operation and a faster method was invented which had the wires already in place as copper strips on a plastic board with holes for the leads of the components to be inserted and soldered on. As the industry matured these boards became multi-layered, so many circuits could be established and as the demands for miniaturisation grew the boards evolved into thin flexible sheets that could for example be fitted inside cameras or mobile phones.

Process Improvement and Change Management - Understand the need to establish new business processes quickly and therefore phase in improvements and enhancements. Know how to manage and match changing requirements, with specifications and implemented solutions.

Product Creation Cycle - Knowledge about development processes, phases, product and development life cycles.

Production Technology - An understanding of the manufacturing and test processes in producing electronic components.

Project Management - Understand the requirements of working as part of a team to achieve a specific goal. This includes what has to be done both as a team member and as a team leader. Should cover basic project management activities such as planning and scheduling, estimating, project management and control, risk issues and change management, status and progress reporting. There is a wide range of programs available to assist the project manager with this task and whilst it is useful to have experience of these, a good grasp of the basic concepts is more valuable.

Quality Assurance - Understand the quality development process the industry standards and approaches to ensuring improving product quality. Understand why companies have quality standards and check for conformance. Understand the main industry quality standards.

Radio Frequency (RF) Circuit Design - Being able to Design standard RF circuits. Have knowledge of passive and active RF circuits, amplifiers, oscillators, mixers, filters.

Radio Frequency (RF) Design Methods - Being able to: Implement known theories and develop new ones for RF circuit simulation. Have knowledge of: circuit simulation theory, circuit simulation tools, analogue circuit design, digital circuit design.

Radio Frequency (RF) Design Tools - Knowledge of and ability to use the relevant RF design tools in schematics entry, circuit simulating, layout design, PCB design etc.

Radio Frequency (RF) Theory - Knowledge of RF theory: microwave components, antennas, radio-wave progress, radio transmitters and receivers, radio technology applications, basic structure of a radio system etc.

RFIC Design Tools - RFIC design tools.

Radio Technology - Understanding of radio spectra and the impact of climatic and geographical restrictions, radio interference and security.

Reliability Engineering - The electronic components that will be used to realise a specified circuit design are subject to and affect the physical environment. For example, voltage and temperature changes will affect their reliability. The circuits will generate electromagnetic radiation and this will affect the operation of other electronic devices. Reliability Engineering is the discipline of designing devices with these factors in mind to produce reliable long-lived devices. Knowledge and know-how of component and material characteristics, thermal design, electrical and magnetic cross-talk, leakage, EMC and design rules like de-rating are required for this job.

Rollout Issue - Understand issues associated with replicating a system in a large number of locations, e.g. installing a computer system in every store of a major high street retailer. This involves the project management of issues such as conducting site surveys, logistics and staff training.

Security - See encryption.

SDH and PDH - SDH (Synchronous Digital Hierarchy) is a standard technology for synchronous data transmission on optical media such as fibre optic cables. It provides faster and less expensive network interconnection than traditional PDH (Plesiochronous Digital Hierarchy) equipment, which predates it. In digital telephone transmission, "synchronous" means the bits from one call are carried within one transmission frame. "Plesiochronous" means "almost (but not) synchronous," or a call that must be extracted from more than one transmission frame.

Software Engineering - Knowledge of the software technologies on which modern systems are based (e.g. operating systems, programming languages). Able to architect, design and develop individual components or major products. Understands the theories underlying these components. Understand how applications use the services of operating systems and concepts such as processors, working storage, message passing, and transactions processing. Unix and NT are the dominant operating systems in the computer industry today.

SQL - SQL (Structured Query Language) is a standard interactive and programming language for getting information from and updating a database. Queries take the form of a command language that lets you select, insert, update, find out the location of data, and so forth. There is also a programming interface. Database are used to store and manage data can have a wide variety of structures depending on how they are to be accessed. A personal organiser or address book has a simple structure of a series of entries or records with different types of information such as name and telephone number, stored in the same relative place in each record. SQL is a standard which allows many different programs to access information in databases and is widely used in commercial applications.

Standards - Industry standards for Quality and Security see those definitions.

Statistical Analysis - Is confident and accurate in applying basic statistics and queuing theory.

Systems Design and Architecture - Before a system can be designed to meet a customer's requirements one needs to have a clear understanding of those requirements. The first skill therefore in Systems Design and Architecture is Requirements Analysis, the critical reading of customer requirement documents and questioning and testing for understanding. To do this requires an understanding of good system design, the role of systems architectures and how performance, availability, security and usability requirements are incorporated. Understand the issues involved in integrating multiple components, the need for and variability of Standards. Have experience of software - hardware compatibility problems and application integration issues.

Systems Development Methods - Know and be able to use formal methods in the design and building of computer systems. Understand the importance of standards in systems development and be aware of some common examples. Understand the different stages of systems development, e.g. requirements analysis, specification, design, implementation, etc.

Systems Development Tools - Understand the use that can be made of tools in all stages of computer systems development. Make use of specific tools to support specific activities. Understand different verification methods.

Systems Management Concepts - Understand the need for the major systems management concepts of change control, security, capacity planning, backup and recovery, and data management.

TCP/IP - TCP/IP (Transmission Control Protocol/Internet Protocol) is the basic communication language or protocol of the Internet. It can also be used as a communications protocol in the private networks called Intranets. When you are set up with direct access to the Internet, your computer is provided with a copy of the TCP/IP program just as every other computer that you may send messages to or get information from also has a copy of TCP/IP. Each gateway computer on the network checks this address to see where to forward the message. Even though some packets from the same message are routed differently than others, they'll be reassembled at the destination. TCP/IP is a two-layered program. The higher layer, Transmission

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Control Protocol, manages the assembling of a message or file into smaller packets that are transmitted over the Internet and received by a TCP layer that reassembles the packets into the original message. The lower layer, Internet Protocol, handles the address part of each packet so that it gets to the right destination.

Technical Documentation - Able to organise documents and reports and to express complex technical subjects in an understandable manner.

Technology Trends - Understand the directions in which technology is changing and able to formulate some personal views in this regard. Able to understand the implications of these trends for business and for the development of specific solutions when appropriate.

Technology, Component and Material Knowledge - Knowledge and know-how to select new components, e.g. PCB (Printed Circuit Board) etc. technologies. Understanding principles of selecting components, materials and suppliers.

Telecom Product Knowledge - Knowledge about telecommunications networks, network types and structures and network element types and functions. Also basic knowledge about telecom principles such as protocols, traffic theory and the principles and effects of load and congestion.

Telecom Technology in Network Element Level - Understanding about how different types of network elements operate and how these elements (or some specific product) are usually constructed. Also knowledge about network element parameters and control. Architecture level understanding of the structure and function of the system.

Testing - Understand the different levels of testing such as module, functional, systems and integration testing. Appreciate the different types of testing such as functional, performance, usability, recovery, volume tests.

Know how good testing is done and how testability can be designed into products and components. Understand how to evaluate the quality of testing. Able to perform test planning and test case design and to use different test case design methods in black box testing, such as boundary-value analysis, equivalence partitioning, error guessing etc.. Good documentation skills are also required as test plans, problem records and test reports have to be produced and reviewed.

Thermal Design - Being able to design and model thermal properties and environment to meet performance, reliability and cost efficiency constrains.

Troubleshoot Technical Problems - This is the ability to use software or hardware diagnostic tools and procedures to gain an in depth understanding of why a system is behaving the way it is. Such tools for example include LAN analysers that can monitor the address and data packets being sent down a cable, or a software debugger that allows you to step through the execution of a program instruction by instruction.

UNIX - UNIX is an Operating System as is Windows. Windows allows you to run programmes and manage a PC without having to write programmes yourself to make the hardware do what you want. Windows has provided a universal common look and feel and set of productivity tools (word processors etc). UNIX is another very popular operating system and where as you will find Windows on many Personal Computers, UNIX is used predominately in business and industry. It is used either to provide very high function and performance workstations used to design cars aeroplanes, electronic circuits etc or in businesses to run commercial applications such as accounting, e-business, customer and supplier relationship management or to manage very large databases. The largest computers in the world use UNIX as their operating system.

Use Computer Systems - Be competent in the use of common productivity tools such as word processor, spreadsheet, email and presentation Software, be able to administer PC systems, be familiar with the command line interface of common computer systems. Many technical professionals within the ICT industries develop their hardware or software on either Microsoft's NT Operating System or on UNIX and experience of either or both of these environments would be useful.

W.A.P. - WAP stands for 'Wireless Application Protocol', a system which enables data and application access using the GSM phone system and handsets.

Work Estimation and Scheduling - Be able to break down an activity into different task, be able to identify the types of skill required to perform the tasks, how long the tasks will take and what the dependencies between the tasks are.

X25 - Is a communications protocol that allows computers and telephone exchanges to send information in packets across a network. The packets as well as containing data have 'identificators' called virtual circuit numbers to enable the data to reach the required destination. It also provides flow control functions. It is widely used throughout Europe. X25's function is similar to the TCP/IP protocol, though it does not provide end-end error control as TCT/IP does. X25 is designed for use with telephone lines rather than Local Area Networks.

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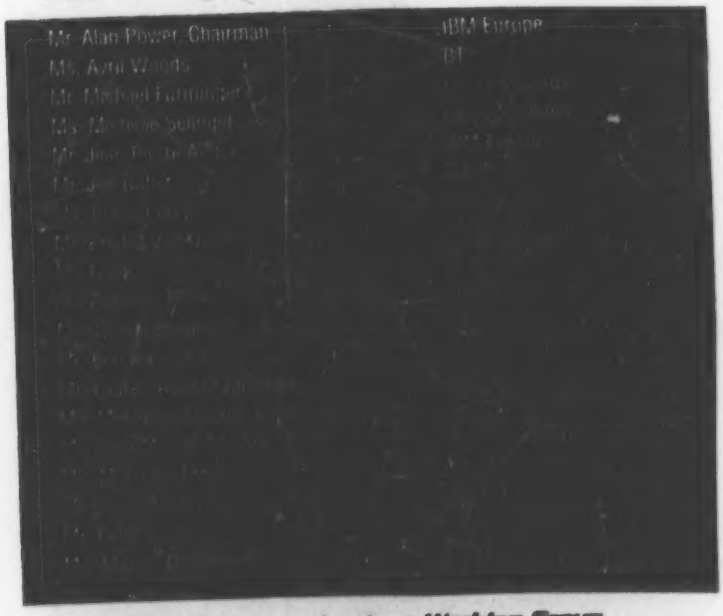

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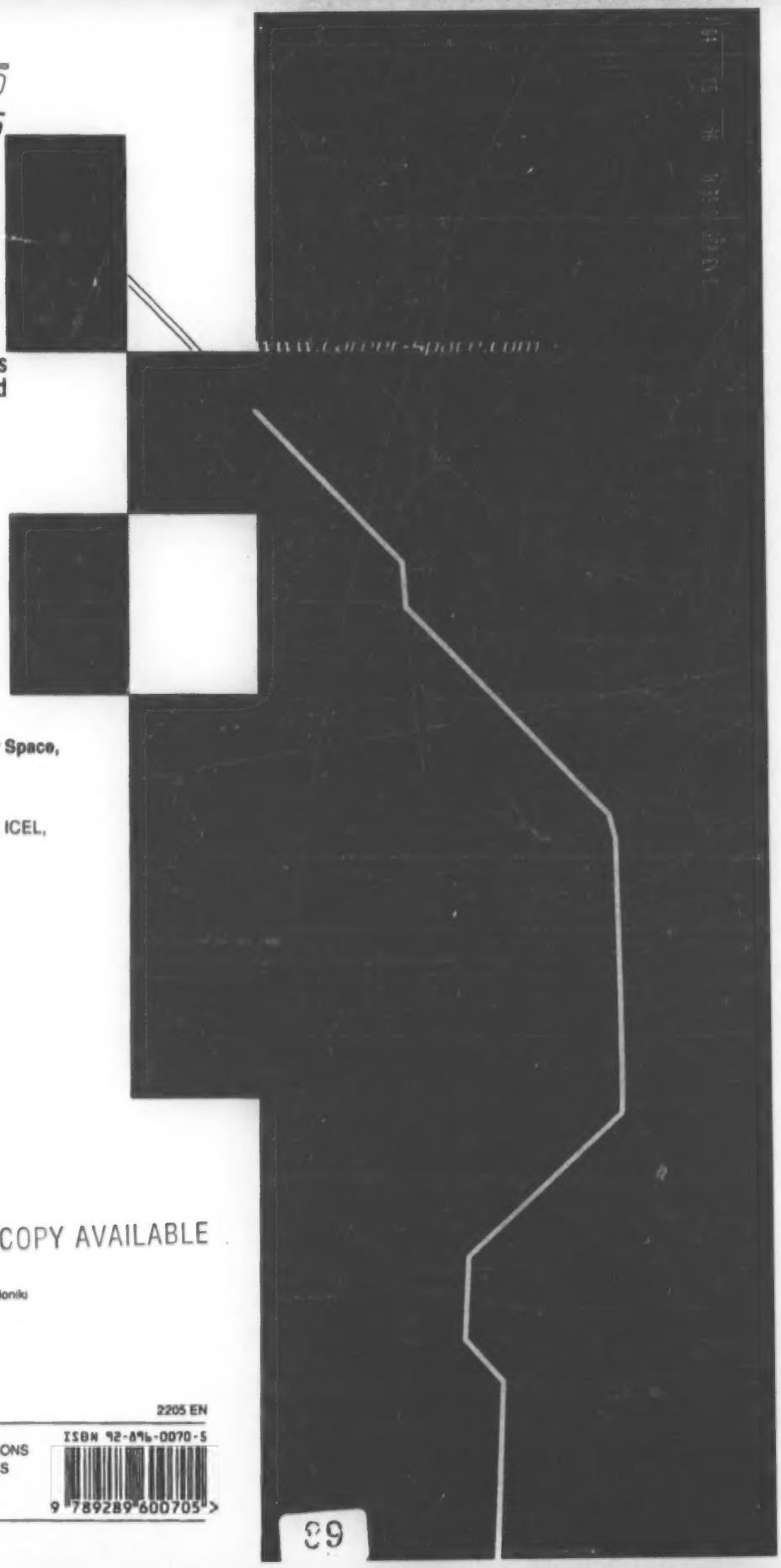

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